Supplementary Information

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Publication	**GEO Id**	**First Condition**	**Second Condition**
Hanina *et al.* [1]	GSE20048	Dicer$^{-/-}$	miR-294 transfected Dicer$^{-/-}$
Melton *et al.* [2]	GSE18840	Dgcr8$^{-/-}$	miR-294 transfected Dgcr8$^{-/-}$
Sinkkonen *et al.* [3]	GSE8503	Dicer$^{-/-}$	miR-290 cluster transfected Dicer$^{-/-}$
Sinkkonen *et al.* [3]	GSE7141	Dicer$^{-/-}$	Dicer$^{+/-}$ (miRNA expressing ESCs)
Zheng *et al.* [4]	GSE30012	Dicer$^{-/-}$	Dicer$^{+/-}$ (miRNA expressing ESCs)

Table 1. Experimental data sets available for the analysis of miR-290-295 cluster function in embryonic stem cells - Each data set consists in measurements of mRNA expression in a first condition (an ES cell line deficient in mature miRNAs) and a second condition (the respective cell line transfected with specific miRNAs or the cell line expressing the full complement of miRNAs). Accession numbers of the data sets in the Gene Expression Omnibus database [5] are specified.

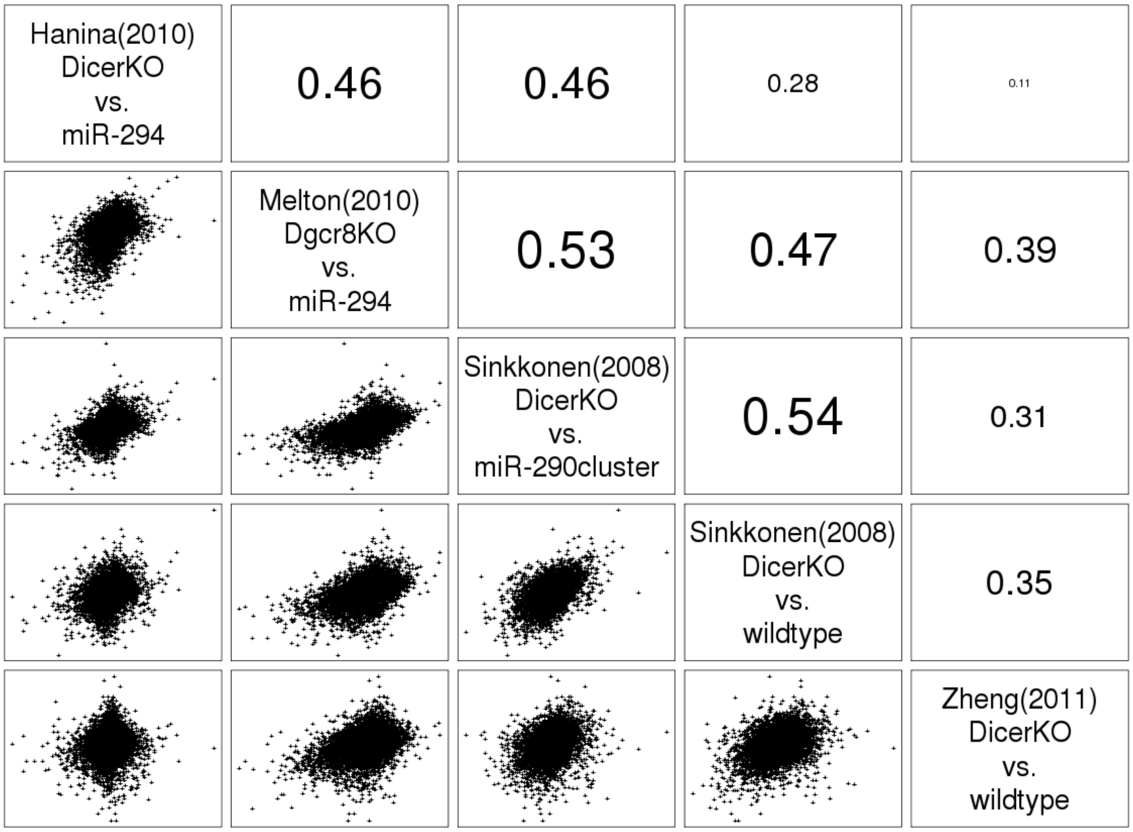

Figure 1. Summary of the relationship between all the data sets that we considered for our study - Scatter plot / correlation coefficient matrix: The identities of the data sets are indicated on the diagonal. Below the diagonal are scatter plots of $\log_2$ - gene expression fold changes in any pair of experiments. Above the diagonal are the corresponding Pearson correlation coefficients.

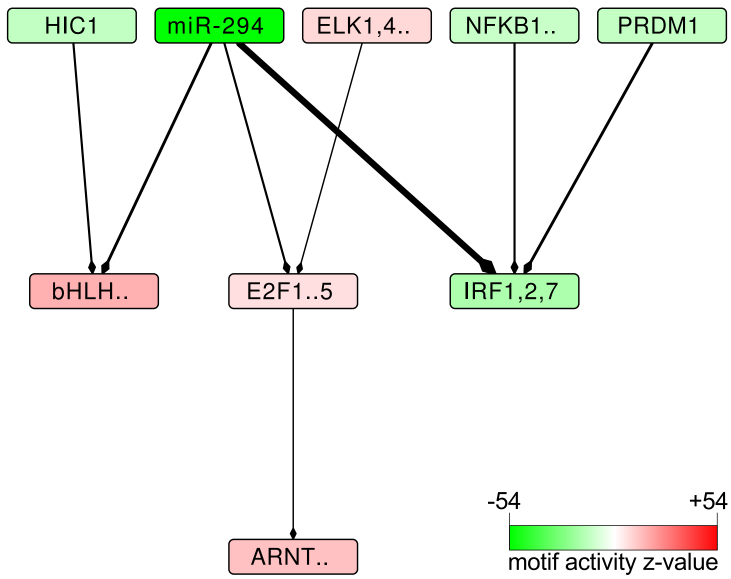

Figure 2. The transcriptional network inferred through a combined MARA analysis of all five experimental data sets (Supplementary Table 1) to be affected by the miRNAs of the AAGUGCU seed family (represented by miR-294) - A directed edge was drawn from a motif A to a motif B if A was consistently (across data sets) predicted to regulate a transcription factor b whose sequence specificity is represented by motif B. The thickness of the edge is proportional to the product of the probabilities that A targets b across data sets. For the clarity of the figure, only edges with a target probability product > 0.135 and only motifs with absolute z-values > 5 are shown. The intensity of the color of a box representing a motif is proportional to the significance of the motif (the corresponding z-values can be found in Suppl. Table 5). Red indicates an increase and green a decrease in activity, corresponding to an increased and decreased, respectively, expression of the targets of the motif in the presence of the miRNAs. The full motif names as well as the corresponding transcription factors are listed in Supplementary Table 7.

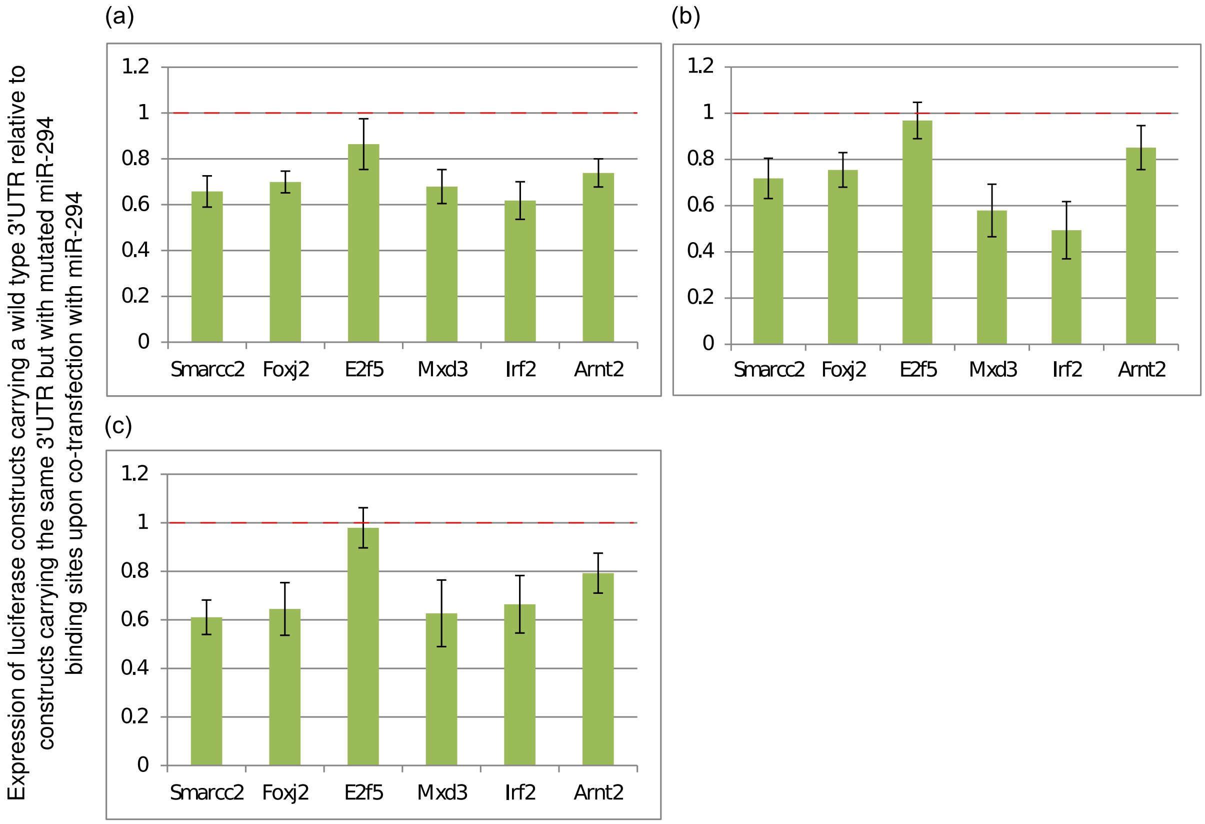

Figure 3. Results of luciferase assays - (a), **(b)** and **(c)** show the results of three independent experiments in which the effect that the miR-294 mimic has on the expression of constructs containing the 3' UTRs of predicted miR-294 targets downstream of the coding region of the Renilla luciferase relative to a control siRNA (si-Ctrl) was measured. The Firefly luciferase was used as a transfection control. Each experiment consisted in three technical replicates. For each of the wildtype and mutant constructs we calculated the mean (μ) and the standard deviation (σ) of the ratios of Renilla-to-Firefly expression ratio in all pairs of miR-294 vs. si-Ctrl transfections that were done in an individual experiment. We thus obtained, for each target gene, estimates of the mean and standard deviation of the response of the wild type 3'UTR (μ_{wt}, σ_{wt}) and the mutated 3'UTR (μ_{mut}, σ_{mut}). Finally, we calculated the ratio of these means ($r_{wt/mut} = \frac{\mu_{wt}}{\mu_{mut}}$) and the corresponding standard deviation $\sigma_{wt/mut} = r_{wt/mut} * \sqrt{(\sigma_{wt}/\mu_{wt})^2 + (\sigma_{mut}/\mu_{mut})^2}$. The estimates obtained from the three independent experiments are shown in panels **(a)** - **(c)** of the figure.

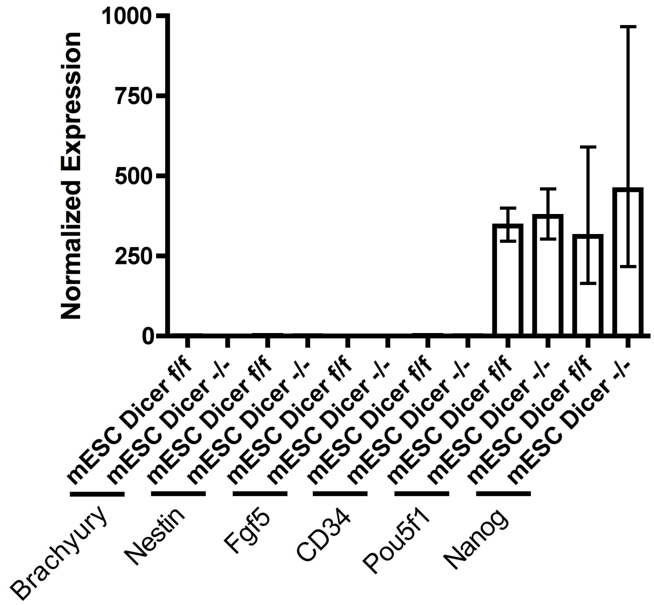

Figure 4. Expression of markers that are indicative of the pluripotent and differentiation state of mESCs - Total RNA was extracted from the DCR$^{flox/flox}$ and DCR$^{-/-}$ mESCs as described in the methods section. qRT-PCR reactions were run in triplicate using the following primer pairs as described in [6]. Brachyury, Nestin, Fgf5, and CD34 all serve as markers of differentiation and were all very lowly expressed in both stem cell lines, whereas the pluripotency markers Pou5f1 (Oct4) and Nanog were very highly expressed in comparison (±SEM; n=3). Both DCR$^{flox/flox}$ and DCR$^{-/-}$ cells express similar amounts of each marker showing that DCR$^{-/-}$ are not differentiated.

gene.name	entrez.id	target.probability
Rnf38	73469	0.34
Dazap2	23994	0.72
Zfp148	22661	0.78
Phactr4	100169	0.45
Zbtb6	241322	0.54
Mef2a	17258	0.71
1810013L24Rik	69053	0.60
Mecp2	17257	0.17
Spop	20747	0.26
Tmem64	100201	0.40
Tnfaip1	21927	0.72
Lclat1	225010	0.80
Ostm1	14628	0.75
Cxadr	13052	0.76
Muted	17828	0.11
Frmd4a	209630	0.82
Foxj3	230700	0.80
Lcorl	209707	0.47
Mmp23	26561	0.15
Gtdc1	227835	0.61
Ube2j1	56228	0.58
Entpd7	93685	0.05
BC013529	215751	0.69
Zfp46	22704	0.61
Irf9	16391	0.82
Fyco1	17281	0.40
Blcap	53619	0.67
Btg1	12226	0.82
Dcaf7	71833	0.63
Arhgef18	102098	0.82
Pip4k2a	18718	0.36
Pik3r3	18710	0.43
Ddhd1	114874	0.72
Aebp2	11569	0.87
Wee1	22390	0.70
Wfs1	22393	0.70
Ube2w	66799	0.67
Nr2c1	22025	0.82
Irf2bp2	270110	0.90
Dcaf6	74106	0.13
Chn2	69993	0.30
Rtn1	104001	0.74
Dgke	56077	0.77
Dock2	94176	0.47
Trps1	83925	0.79
P2rx4	18438	0.61
Crk	12928	0.71
Zbtb41	226470	0.96

March8	71779	0.86
Zfp367	238673	0.56
Psd3	234353	0.47
Wdr1	22388	0.74
Zc3h12c	244871	0.71
Polk	27015	0.42
Msl1	74026	0.61
Kpna2	16647	0.40
Rb1cc1	12421	0.41
Ncoa7	211329	0.62
Ano6	105722	0.76
Sipa1l3	74206	0.67
Mbd2	17191	0.11
Snx8	231834	0.86
Tnrc6b	213988	0.57
Gnb5	14697	0.39
Fndc3a	319448	0.66
Kirrel	170643	0.83
Znrf3	407821	0.79
Ccnd2	12444	0.85
Rab22a	19334	0.88
Ptp4a1	19243	0.10
Tceb3	27224	0.61
Irf2	16363	0.39
Akt1	11651	0.31
Mtf1	17764	0.93
Zbtb7a	16969	0.91
Mtmr3	74302	0.75
Ankrd32	105377	0.11
F3	14066	0.71
Plekha3	83435	0.66
BC037034	231807	0.64
Agfg2	231801	0.81
Ccdc88a	108686	0.62
Tcfap4	83383	0.64
Rictor	78757	0.21
Elavl2	15569	0.60
Ankrd57	268301	0.15
Rasal2	226525	0.63
Zfp518a	72672	0.39
Lats2	50523	0.54
Epc2	227867	0.06
Zbtb44	235132	0.86
Hs2st1	23908	0.56
Cnot6l	231464	0.28
Myo9a	270163	0.80
Ssx2ip	99167	0.79
8430427H17Rik	329540	0.74
Abca1	11303	0.85

Calm1	12313	0.79
Plagl2	54711	0.94
Tbcel	272589	0.36
Plekhm1	353047	0.81
2700081O15Rik	108899	0.56
Arhgef17	207212	0.81
AI848100	226551	0.83
Prdm4	72843	0.68
Lin52	217708	0.73
Pou6f1	19009	0.84
Pgbd5	209966	0.79
Ikzf2	22779	0.98
Apbb2	11787	0.09
Mcl1	17210	0.80
Zfp800	627049	0.56
Acvr1	11477	0.49
Itgb3	16416	0.21
Lamp2	16784	0.60
Mbnl2	105559	0.36
Zfp827	622675	0.72
Nr2f2	11819	0.94
Rnf216	108086	0.81
E2f2	242705	0.98
Il28ra	242700	0.17
Bahd1	228536	0.76
Ppp6c	67857	0.70
Slc16a9	66859	0.85
Hn1	15374	0.86
Usp42	76800	0.50
Trim36	28105	0.83
Tgfbrap1	73122	0.45
Phc3	241915	0.86
Rbl1	19650	0.61
Mbnl1	56758	0.62
Txnip	56338	0.93
Prkaa1	105787	0.04
Snrk	20623	0.80
4933403F05Rik	108654	0.86
Pbx3	18516	0.66
Arnt2	11864	0.75
Pbx1	18514	0.01
Kat2b	18519	0.60
Fzd6	14368	0.39
Cc2d1a	212139	0.49
Nfib	18028	0.85
Clip4	78785	0.60
Klf13	50794	0.70
Mfn2	170731	0.57
Map3k2	26405	0.97

Fam168b	214469	0.81
Inhbb	16324	0.76
Cpeb2	231207	0.76
Crtc2	74343	0.67
Tnrc6c	217351	0.43
Znfx1	98999	0.66
Fbxo10	269529	0.37
Slc17a5	235504	0.07
Stk38l	232533	0.79
Zfp597	71063	0.50
Zfp91	109910	0.41
Clic4	29876	0.65
Tbc1d8b	245638	0.46
9530068E07Rik	213673	0.03
Kif13a	16553	0.05
Brp44l	55951	0.28
Rab11fip5	52055	0.85
Znf512b	269401	0.65
Lefty1	13590	0.53
Usp46	69727	0.55
Jazf1	231986	0.71
Lefty2	320202	0.78
Tmem123	71929	0.61
Pfn2	18645	0.52
Mtus1	102103	0.81
4933434E20Rik	99650	0.45
Syap1	67043	0.40
Sbf1	77980	0.22
Uevld	54122	0.73
Arhgef7	54126	0.80
Neo1	18007	0.16
Necap1	67602	0.14
Zfp704	170753	0.29
Gcap14	72972	0.02
Slc25a40	319653	0.74
Sass6	72776	0.33
Cfl2	12632	0.37
Adam9	11502	0.64
Psmf1	228769	0.07
Zbtb4	75580	0.50
Arid4b	94246	0.64
Fbxo11	225055	0.71
Tapt1	231225	0.67
Tgfbr2	21813	0.90
Etv1	14009	0.17
Zcchc24	71918	0.62
Mllt6	246198	0.95
Rhoc	11853	0.36
Tmcc1	330401	0.30

Camk2n1	66259	0.82
Mtmr4	170749	0.53
Hhip	15245	0.79
Zbtb37	240869	0.02
Il6st	16195	0.76
Zkscan1	74570	0.82
Tiparp	99929	0.41
Clock	12753	0.75
Twf1	19230	0.51
Eif2c1	236511	0.95
E2f7	52679	0.95
Fam120a	218236	0.42
Pank3	211347	0.33
Mast3	546071	0.70
Foxj2	60611	0.59
Wdr26	226757	0.40
Smarcc2	68094	0.65
Syde1	71709	0.75
Ptpn21	24000	0.78
Dctn4	67665	0.54
Hipk3	15259	0.60
Cdkn1a	12575	0.79
Ralgds	19730	0.44
Nfya	18044	0.49
Tanc2	77097	0.52
Rora	19883	0.34
Coro2b	235431	0.40
Ash1l	192195	0.54
Cxcr4	12767	0.72
Derl2	116891	0.87
Dpp8	74388	0.61
Rab11a	53869	0.14
Zfyve26	211978	0.67
Tnrc18	231861	0.79
Cdk19	78334	0.85
Asf1b	66929	0.80
Rsf1	233532	0.61
Epas1	13819	0.31
Myst3	244349	0.42
D630045J12Rik	330286	0.73
Ube2b	22210	0.76
E2f5	13559	0.53
Acbd5	74159	0.68
Unkl	74154	0.86
Wdr37	207615	0.97
Phlpp2	244650	0.92
Zfp238	30928	0.75
Prdm16	70673	0.88
Tmem170b	621976	0.97

Ss18l1	269397	0.86
March11	211147	0.16
Reep3	28193	0.90
Zdhhc9	208884	0.47
Acer3	66190	0.33
Golga1	76899	0.35
Hivep2	15273	0.71
Arhgef10	234094	0.41

Table 2. Genes predicted to be a direct target of the miR AAGUGCU seed family (by TargetScan) and that are significantly downregulated within all three experiments.

name	zvalue	abbreviation
AAGUGCU	-47.94	miR-294
IRF1,2,7.p3	-16.29	IRF1,2,7
bHLH_family.p2	13.00	bHLH..
HIC1.p2	-11.95	HIC1
TFEB.p2	-11.90	TFEB
ARNT_ARNT2_BHLHB2_MAX_MYC_USF1.p2	11.60	ARNT..
PRDM1.p3	-10.67	PRDM1
TBP.p2	9.83	TBP
SRF.p3	9.69	SRF
SP1.p2	-9.06	SP1
PAX5.p2	-8.97	PAX5
AHR_ARNT_ARNT2.p2	8.39	AHR..
HMX1.p2	8.29	HMX1
ZNF143.p2	8.22	ZNF143
TFDP1.p2	7.88	TFDP1
NFKB1_REL_RELA.p2	-7.53	NFKB1..
RFX1..5_RFXANK_RFXAP.p2	-7.25	RFX1..5..
MYB.p2	-7.07	MYB
FOXD3.p2	7.02	FOXD3
DMAP1_NCOR{1,2}_SMARC.p2	-6.98	..SMARC
ELK1,4_GABP{A,B1}.p3	6.79	ELK1,4..
PAX2.p2	-6.70	PAX2
E2F1..5.p2	6.62	E2F1..5
MAFB.p2	-6.54	MAFB
HES1.p2	6.50	HES1
FOXA2.p3	6.30	FOXA2
FOXN1.p2	-6.24	FOXN1
SOX5.p2	6.08	SOX5
FOX{I1,J2}.p2	-5.62	FOXI1,J2
TFAP2B.p2	-5.55	TFAP2B
ZEB1.p2	5.49	ZEB1
PATZ1.p2	5.45	PATZ1
HOX{A6,A7,B6,B7}.p2	-5.27	HOXA6,A..
SPZ1.p2	-5.26	SPZ1
DBP.p2	-5.11	DBP
HOX{A5,B5}.p2	5.07	HOXA5,B5
REST.p3	5.06	REST
PITX1..3.p2	5.06	PITX1..3
PAX4.p2	-4.94	PAX4
TAL1_TCF{3,4,12}.p2	-4.84	TAL1..
SRY.p2	-4.82	SRY
BACH2.p2	-4.82	BACH2
TGIF1.p2	-4.80	TGIF1
NRF1.p2	4.79	NRF1
FOXL1.p2	-4.76	FOXL1
STAT5{A,B}.p2	-4.70	STAT5A,B
NFE2L2.p2	4.51	NFE2L2
SNAI1..3.p2	-4.47	SNAI1..3

ETS1,2.p2	-4.41	ETS1,2
ATF5_CREB3.p2	-4.29	ATF5..
RBPJ.p2	-4.20	RBPJ
ZNF238.p2	4.19	ZNF238
MZF1.p2	-4.17	MZF1
IKZF1.p2	4.17	IKZF1
POU5F1_SOX2{dimer}.p2	4.07	POU5F1..
NFE2.p2	-3.90	NFE2
ZNF384.p2	-3.87	ZNF384
GLI1..3.p2	-3.74	GLI1..3
FOXO1,3,4.p2	-3.66	FOXO1,3,4
TEAD1.p2	-3.63	TEAD1
TFCP2.p2	-3.58	TFCP2
KLF4.p3	-3.53	KLF4
GATA6.p2	3.47	GATA6
ATF6.p2	3.46	ATF6
TLX1..3_NFIC{dimer}.p2	-3.45	TLX1..3..
JUN.p2	3.44	JUN
MTF1.p2	-3.26	MTF1
ZBTB16.p2	3.09	ZBTB16
POU6F1.p2	3.09	POU6F1
HMGA1,2.p2	3.03	HMGA1,2
FOX{D1,D2}.p2	-2.97	FOXD1,D2
FOXQ1.p2	-2.94	FOXQ1
MYFfamily.p2	2.94	MYFfamily
KLF12.p2	2.80	KLF12
LMO2.p2	-2.74	LMO2
SREBF1,2.p2	-2.74	SREBF1,2
CEBPA,B_DDIT3.p2	2.68	CEBPA,B..
CDX1,2,4.p2	-2.68	CDX1,2,4
FEV.p2	2.62	FEV
CTCF.p2	2.62	CTCF
STAT2,4,6.p2	-2.55	STAT2,4,6
MAZ.p2	-2.54	MAZ
PBX1.p2	-2.54	PBX1
NR1H4.p2	2.47	NR1H4
EVI1.p2	-2.41	EVI1
PRRX1,2.p2	-2.36	PRRX1,2
NKX3-1.p2	-2.26	NKX3-1
NANOG{mouse}.p2	2.18	NANOGmo..
LHX3,4.p2	2.18	LHX3,4
HOX{A4,D4}.p2	2.12	HOXA4,D4
SPI1.p2	-2.10	SPI1
HIF1A.p2	2.09	HIF1A
EHF.p2	-2.08	EHF
NFIX.p2	-2.07	NFIX
NANOG.p2	2.02	NANOG
GFI1.p2	2.00	GFI1
RXR{A,B,G}.p2	1.93	RXRA,B,G

RREB1.p2	1.90	RREB1
ATF4.p2	1.90	ATF4
EOMES.p2	-1.81	EOMES
EN1,2.p2	-1.81	EN1,2
RORA.p2	1.79	RORA
TCF4_dimer.p2	1.77	TCF4..
RXRA_VDR{dimer}.p2	1.76	RXRA..
HAND1,2.p2	1.70	HAND1,2
MYOD1.p2	-1.67	MYOD1
LEF1_TCF7_TCF7L1,2.p2	1.65	LEF1..
ZFP161.p2	-1.62	ZFP161
PPARG.p2	-1.62	PPARG
NKX2-2,8.p2	-1.62	NKX2-2,8
STAT1,3.p3	-1.61	STAT1,3
SOX17.p2	-1.57	SOX17
EWSR1-FLI1.p2	1.56	EWSR1-F..
GFI1B.p2	-1.55	GFI1B
EP300.p2	-1.54	EP300
ALX1.p2	-1.51	ALX1
ZBTB6.p2	-1.51	ZBTB6
ATF2.p2	-1.47	ATF2
AR.p2	-1.47	AR
SOX{8,9,10}.p2	1.45	SOX8,9,10
ADNP_IRX_SIX_ZHX.p2	1.39	ADNP..
RXRG_dimer.p3	1.35	RXRG..
TFAP2{A,C}.p2	-1.31	TFAP2A,C
VSX1,2.p2	-1.24	VSX1,2
GZF1.p2	-1.22	GZF1
PDX1.p2	1.22	PDX1
PAX6.p2	-1.18	PAX6
NKX2-1,4.p2	-1.15	NKX2-1,4
CUX2.p2	-1.13	CUX2
NR5A1,2.p2	1.05	NR5A1,2
POU5F1.p2	-1.05	POU5F1
NKX6-1,2.p2	1.02	NKX6-1,2
SPIB.p2	1.02	SPIB
ELF1,2,4.p2	0.99	ELF1,2,4
CRX.p2	-0.96	CRX
NKX2-3_NKX2-5.p2	0.94	NKX2-3..
IKZF2.p2	0.93	IKZF2
GTF2I.p2	-0.92	GTF2I
GATA1..3.p2	-0.91	GATA1..3
ONECUT1,2.p2	-0.87	ONECUT1,2
MYBL2.p2	0.85	MYBL2
FOX{C1,C2}.p2	0.84	FOXC1,C2
XBP1.p3	-0.75	XBP1
FOX{F1,F2,J1}.p2	-0.75	FOXF1,F..
ESR1.p2	0.70	ESR1
NFIL3.p2	0.69	NFIL3

ARID5B.p2	0.69	ARID5B
NFE2L1.p2	0.67	NFE2L1
NFATC1..3.p2	0.67	NFATC1..3
ZIC1..3.p2	0.62	ZIC1..3
HOXA9_MEIS1.p2	0.60	HOXA9..
T.p2	-0.56	T
PAX8.p2	0.51	PAX8
ESRRA.p2	0.50	ESRRA
CREB1.p2	-0.50	CREB1
ZNF423.p2	-0.48	ZNF423
SOX2.p2	0.47	SOX2
POU2F1..3.p2	-0.45	POU2F1..3
NFY{A,B,C}.p2	0.44	NFYA,B,C
TFAP4.p2	-0.44	TFAP4
HSF1,2.p2	-0.44	HSF1,2
HLF.p2	0.43	HLF
HNF1A.p2	0.41	HNF1A
YY1.p2	-0.41	YY1
TLX2.p2	0.40	TLX2
MSX1,2.p2	-0.40	MSX1,2
TP53.p2	0.38	TP53
HBP1_HMGB_SSRP1_UBTF.p2	-0.36	HBP1..
FOXP3.p2	-0.36	FOXP3
AIRE.p2	0.33	AIRE
EBF1.p2	-0.32	EBF1
TBX4,5.p2	0.32	TBX4,5
EGR1..3.p2	0.32	EGR1..3
SMAD1..7,9.p2	-0.31	SMAD1....
FOSL2.p2	0.31	FOSL2
FOS_FOS{B,L1}_JUN{B,D}.p2	0.31	FOS..
HNF4A_NR2F1,2.p2	-0.29	HNF4A..
NKX3-2.p2	-0.26	NKX3-2
POU3F1..4.p2	-0.25	POU3F1..4
PAX3,7.p2	0.24	PAX3,7
NR6A1.p2	-0.24	NR6A1
NHLH1,2.p2	0.22	NHLH1,2
NR3C1.p2	-0.21	NR3C1
CDC5L.p2	-0.19	CDC5L
GTF2A1,2.p2	0.13	GTF2A1,2
MEF2{A,B,C,D}.p2	0.11	MEF2A,B..
BPTF.p2	0.11	BPTF
ZNF148.p2	0.05	ZNF148
RUNX1..3.p2	0.04	RUNX1..3
POU1F1.p2	-0.03	POU1F1

Table 3. Three experiments combined MARA results **including only the miR AAGUGCU seed family** ranked by absolute activity z-values.

name	zvalue	abbreviation
AAGUGCU	-31.81	miR-294
AAAGUGC	-31.28	miR-17-..
IRF1,2,7.p3	-17.15	IRF1,2,7
bHLH_family.p2	13.43	bHLH..
TFEB.p2	-11.44	TFEB
HIC1.p2	-11.25	HIC1
ARNT_ARNT2_BHLHB2_MAX_MYC_USF1.p2	11.16	ARNT..
AAGGCAC	-11.02	miR-124
PRDM1.p3	-10.68	PRDM1
UCAAGUA	-10.22	miR-26a..
AGCACCA	9.68	miR-29a..
CAGUGCA	-9.67	miR-148..
TBP.p2	9.26	TBP
SP1.p2	-9.08	SP1
SRF.p3	8.94	SRF
PAX5.p2	-8.51	PAX5
AHR_ARNT_ARNT2.p2	8.28	AHR..
TFDP1.p2	8.25	TFDP1
ZNF143.p2	8.15	ZNF143
HMX1.p2	7.83	HMX1
GUGCAAA	-7.42	miR-19a..
NFKB1_REL_RELA.p2	-7.23	NFKB1..
RFX1..5_RFXANK_RFXAP.p2	-7.11	RFX1..5..
DMAP1_NCOR{1,2}_SMARC.p2	-6.94	..SMARC
FOXD3.p2	6.94	FOXD3
MYB.p2	-6.86	MYB
ELK1,4_GABP{A,B1}.p3	6.78	ELK1,4..
AGUGCAA	-6.73	miR-130..
HES1.p2	6.71	HES1
E2F1..5.p2	6.61	E2F1..5
GUAGUGU	-6.52	miR-142..
FOXA2.p3	6.49	FOXA2
SOX5.p2	6.00	SOX5
MAFB.p2	-5.95	MAFB
FOXN1.p2	-5.86	FOXN1
GGAAGAC	5.70	miR-7a-7b
FOX{I1,J2}.p2	-5.68	FOXI1,J2
PAX2.p2	-5.66	PAX2
PATZ1.p2	5.54	PATZ1
AGCAGCA	-5.51	miR-15a..
DBP.p2	-5.35	DBP
HOX{A6,A7,B6,B7}.p2	-5.25	HOXA6,A..
ZEB1.p2	5.24	ZEB1
NRF1.p2	5.21	NRF1
SPZ1.p2	-5.19	SPZ1
CUUUGGU	-5.13	miR-9
AGUGGUU	-5.10	miR-140..
TFAP2B.p2	-5.08	TFAP2B

TAL1_TCF{3,4,12}.p2	-4.99	TAL1..
SRY.p2	-4.93	SRY
FOXL1.p2	-4.80	FOXL1
PITX1..3.p2	4.70	PITX1..3
BACH2.p2	-4.66	BACH2
GGCUCAG	4.64	miR-24
PAX4.p2	-4.60	PAX4
AAGGUGC	-4.55	miR-18a..
STAT5{A,B}.p2	-4.55	STAT5A,B
REST.p3	4.49	REST
ETS1,2.p2	-4.47	ETS1,2
HOX{A5,B5}.p2	4.40	HOXA5,B5
TGIF1.p2	-4.36	TGIF1
SNAI1..3.p2	-4.28	SNAI1..3
NFE2L2.p2	4.27	NFE2L2
IKZF1.p2	4.21	IKZF1
RBPJ.p2	-4.17	RBPJ
CACAGUG	-4.05	miR-128
FOXO1,3,4.p2	-4.03	FOXO1,3,4
GAGGUAG	4.02	let-7a-..
ZNF384.p2	-3.87	ZNF384
MZF1.p2	-3.86	MZF1
AAUACUG	-3.79	miR-200..
NFE2.p2	-3.79	NFE2
ATF5_CREB3.p2	-3.75	ATF5..
ZNF238.p2	3.74	ZNF238
CAGCAGG	3.73	miR-214..
POU5F1_SOX2{dimer}.p2	3.73	POU5F1..
AUUGCAC	-3.66	miR-25-..
GATA6.p2	3.54	GATA6
JUN.p2	3.51	JUN
UGUGCUU	3.49	miR-218
GLI1..3.p2	-3.46	GLI1..3
TFCP2.p2	-3.44	TFCP2
UCACAGU	3.42	miR-27a..
CCCUGAG	-3.33	miR-125..
TLX1..3_NFIC{dimer}.p2	-3.32	TLX1..3..
UUGGCAC	-3.30	miR-96
TEAD1.p2	-3.29	TEAD1
HMGA1,2.p2	3.20	HMGA1,2
AGCUGCC	3.12	miR-22
KLF4.p3	-3.11	KLF4
POU6F1.p2	3.08	POU6F1
GUCAGUU	-3.07	miR-223
GUAAACA	-3.07	miR-30a..
AGCAGCG	3.07	miR-503
ATF6.p2	3.06	ATF6
ZBTB16.p2	3.04	ZBTB16
AUGGCAC	-2.99	miR-183

MTF1.p2	-2.98	MTF1
FOX{D1,D2}.p2	-2.91	FOXD1,D2
GCUGGUG	2.90	miR-138
UUUUUGC	2.83	miR-129..
LMO2.p2	-2.82	LMO2
FOXQ1.p2	-2.78	FOXQ1
SREBF1,2.p2	-2.78	SREBF1,2
CDX1,2,4.p2	-2.76	CDX1,2,4
KLF12.p2	2.76	KLF12
MYFfamily.p2	2.75	MYFfamily
STAT2,4,6.p2	-2.70	STAT2,4,6
MAZ.p2	-2.67	MAZ
FEV.p2	2.62	FEV
ACAGUAU	2.59	miR-144
HIF1A.p2	2.56	HIF1A
NR1H4.p2	2.49	NR1H4
PBX1.p2	-2.44	PBX1
AACACUG	-2.39	miR-141..
CTCF.p2	2.39	CTCF
EVI1.p2	-2.36	EVI1
UGCAUAG	2.23	miR-153
CEBPA,B_DDIT3.p2	2.22	CEBPA,B..
NKX3-1.p2	-2.20	NKX3-1
CCAGCAU	2.14	miR-338..
RREB1.p2	2.14	RREB1
GAUUGUC	-2.12	miR-219..
RXR{A,B,G}.p2	2.10	RXRA,B,G
GGAAUGU	-2.10	miR-1a-..
CCUUCAU	-2.05	miR-205
ACCCUGU	2.04	miR-10a..
ATF4.p2	2.04	ATF4
EHF.p2	-1.97	EHF
LHX3,4.p2	1.97	LHX3,4
GFI1.p2	1.96	GFI1
NANOG.p2	1.95	NANOG
UUGGUCC	1.94	miR-133..
LEF1_TCF7_TCF7L1,2.p2	1.91	LEF1..
UCCCUUU	1.91	miR-204..
HOX{A4,D4}.p2	1.90	HOXA4,D4
RXRA_VDR{dimer}.p2	1.76	RXRA..
GCUACAU	-1.76	miR-221..
ADNP_IRX_SIX_ZHX.p2	1.75	ADNP..
EN1,2.p2	-1.75	EN1,2
CUCCCAA	1.73	miR-150..
TCF4_dimer.p2	1.73	TCF4..
EOMES.p2	-1.73	EOMES
UCACAUU	1.72	miR-23a..
CCAGUGU	-1.71	miR-199..
NANOG{mouse}.p2	1.71	NANOGmo..

GUAACAG	-1.70	miR-194
NFIX.p2	-1.67	NFIX
EWSR1-FLI1.p2	1.65	EWSR1-F..
AAUCUCU	1.64	miR-216b
ACAGUAC	-1.63	miR-101..
MYOD1.p2	-1.62	MYOD1
EP300.p2	-1.60	EP300
PPARG.p2	-1.58	PPARG
GAUCAGA	-1.55	miR-383
ALX1.p2	-1.54	ALX1
NKX2-2,8.p2	-1.53	NKX2-2,8
GFI1B.p2	-1.48	GFI1B
UUGGCAA	1.48	miR-182
SPI1.p2	-1.42	SPI1
GCAGCAU	1.37	miR-103..
ZFP161.p2	-1.36	ZFP161
AR.p2	-1.34	AR
ATF2.p2	-1.31	ATF2
HAND1,2.p2	1.30	HAND1,2
SOX{8,9,10}.p2	1.29	SOX8,9,10
PRRX1,2.p2	-1.27	PRRX1,2
GZF1.p2	-1.24	GZF1
ZBTB6.p2	-1.23	ZBTB6
FOX{C1,C2}.p2	1.21	FOXC1,C2
AACGGAA	1.20	miR-191
TFAP2{A,C}.p2	-1.18	TFAP2A,C
UGACCUA	1.18	miR-192..
AUGGCUU	1.17	miR-135..
SOX2.p2	1.15	SOX2
AGGUAGU	1.13	miR-196..
AGCUUAU	-1.13	miR-21-..
UUGUUCG	-1.13	miR-375
RXRG_dimer.p3	1.12	RXRG..
NKX6-1,2.p2	1.11	NKX6-1,2
CRX.p2	-1.11	CRX
VSX1,2.p2	-1.11	VSX1,2
NKX2-3_NKX2-5.p2	1.09	NKX2-3..
RORA.p2	1.09	RORA
POU5F1.p2	-1.08	POU5F1
AAUCUCA	1.06	miR-216a
PAX6.p2	-1.05	PAX6
NKX2-1,4.p2	-1.04	NKX2-1,4
UAUUGCU	-1.04	miR-137
PDX1.p2	0.99	PDX1
CUX2.p2	-0.99	CUX2
SPIB.p2	0.98	SPIB
IKZF2.p2	0.97	IKZF2
ELF1,2,4.p2	0.97	ELF1,2,4
GAGAACU	-0.96	miR-146..

ONECUT1,2.p2	-0.95	ONECUT1,2
UAAUGCU	-0.95	miR-155
EBF1.p2	-0.92	EBF1
GGCAAGA	-0.91	miR-31
MYBL2.p2	0.86	MYBL2
NR5A1,2.p2	0.85	NR5A1,2
CGUACCG	0.84	miR-126..
AACCUGG	-0.84	miR-490..
UCCAGUU	-0.81	miR-145
GATA1..3.p2	-0.79	GATA1..3
XBP1.p3	-0.74	XBP1
GAGAUGA	-0.74	miR-143
UGUGCGU	0.71	miR-210
NFIL3.p2	0.71	NFIL3
NFATC1..3.p2	0.68	NFATC1..3
FOX{F1,F2,J1}.p2	-0.66	FOXF1,F..
AACAGUC	-0.66	miR-132..
AUGACAC	0.65	miR-425..
CREB1.p2	-0.65	CREB1
UAAGACG	-0.64	miR-208..
ARID5B.p2	0.63	ARID5B
SOX17.p2	-0.62	SOX17
STAT1,3.p3	-0.58	STAT1,3
ZIC1..3.p2	0.58	ZIC1..3
PAX8.p2	0.51	PAX8
ESRRA.p2	0.51	ESRRA
T.p2	-0.51	T
SMAD1..7,9.p2	-0.51	SMAD1....
AAUGCCC	-0.50	miR-365
ACAUUCA	-0.47	miR-181..
HSF1,2.p2	-0.46	HSF1,2
HLF.p2	0.44	HLF
NFY{A,B,C}.p2	0.44	NFYA,B,C
TLX2.p2	0.44	TLX2
TFAP4.p2	-0.43	TFAP4
ESR1.p2	0.43	ESR1
UGCAUUG	0.43	miR-33
YY1.p2	-0.42	YY1
HNF1A.p2	0.41	HNF1A
TP53.p2	0.41	TP53
FOXP3.p2	-0.41	FOXP3
HOXA9_MEIS1.p2	0.39	HOXA9..
GGAGUGU	0.39	miR-122
NFE2L1.p2	0.38	NFE2L1
HNF4A_NR2F1,2.p2	-0.36	HNF4A..
CUACAGU	-0.36	miR-139..
MSX1,2.p2	-0.35	MSX1,2
ACUGGCC	-0.34	miR-193..
EGR1..3.p2	0.34	EGR1..3

GAUAUGU	-0.34	miR-190..
AIRE.p2	0.32	AIRE
GGACGGA	0.32	miR-184
ZNF423.p2	-0.31	ZNF423
NR3C1.p2	-0.28	NR3C1
GTF2A1,2.p2	0.27	GTF2A1,2
CDC5L.p2	-0.26	CDC5L
POU2F1..3.p2	-0.25	POU2F1..3
HBP1_HMGB_SSRP1_UBTF.p2	-0.23	HBP1..
FOS_FOS{B,L1}_JUN{B,D}.p2	0.23	FOS..
FOSL2.p2	0.20	FOSL2
UAAGACU	0.20	miR-499
PAX3,7.p2	0.20	PAX3,7
NHLH1,2.p2	0.19	NHLH1,2
POU3F1..4.p2	-0.18	POU3F1..4
AACCGUU	0.16	miR-451
ZNF148.p2	-0.16	ZNF148
CGUGUCU	0.15	miR-187
NR6A1.p2	-0.15	NR6A1
GTF2I.p2	-0.14	GTF2I
ACUGCAU	-0.14	miR-217
NKX3-2.p2	-0.13	NKX3-2
MEF2{A,B,C,D}.p2	0.12	MEF2A,B..
BPTF.p2	0.09	BPTF
GGCAGUG	-0.06	miR-34a..
POU1F1.p2	-0.05	POU1F1
RUNX1..3.p2	-0.04	RUNX1..3
UGAAAUG	0.04	miR-203
ACCCGUA	-0.03	miR-99a..
TBX4,5.p2	-0.00	TBX4,5

Table 4. Three experiments combined MARA results **including all miRNA seed families** ranked by absolute activity z-values.

name	zvalue	abbreviation
AAGUGCU	-53.51	miR-294
IRF1,2,7.p3	-17.49	IRF1,2,7
bHLH_family.p2	16.54	bHLH..
TFEB.p2	-13.77	TFEB
ARNT_ARNT2_BHLHB2_MAX_MYC_USF1.p2	13.32	ARNT..
HIC1.p2	-12.99	HIC1
PRDM1.p3	-12.64	PRDM1
NFKB1_REL_RELA.p2	-11.77	NFKB1..
PAX5.p2	-10.90	PAX5
SP1.p2	-9.31	SP1
HES1.p2	9.26	HES1
AHR_ARNT_ARNT2.p2	9.19	AHR..
TFDP1.p2	9.11	TFDP1
HMX1.p2	8.67	HMX1
SPZ1.p2	-8.66	SPZ1
ZNF143.p2	8.61	ZNF143
ELK1,4_GABP{A,B1}.p3	8.45	ELK1,4..
FOXD3.p2	8.22	FOXD3
FOX{D1,D2}.p2	-8.11	FOXD1,D2
NRF1.p2	7.82	NRF1
PITX1..3.p2	7.80	PITX1..3
TEAD1.p2	-7.61	TEAD1
PAX2.p2	-7.56	PAX2
SOX5.p2	7.29	SOX5
HOX{A6,A7,B6,B7}.p2	-7.23	HOXA6,A..
E2F1..5.p2	6.98	E2F1..5
SNAI1..3.p2	-6.78	SNAI1..3
ZEB1.p2	6.76	ZEB1
FOXN1.p2	-6.67	FOXN1
NFE2.p2	-6.64	NFE2
TFAP2B.p2	-6.64	TFAP2B
MZF1.p2	-6.49	MZF1
PAX4.p2	-6.36	PAX4
PATZ1.p2	6.33	PATZ1
FOX{I1,J2}.p2	-6.13	FOXI1,J2
GATA1..3.p2	-6.01	GATA1..3
NFE2L2.p2	5.99	NFE2L2
ETS1,2.p2	-5.92	ETS1,2
ZBTB16.p2	5.64	ZBTB16
RBPJ.p2	-5.56	RBPJ
REST.p3	5.55	REST
GATA6.p2	5.45	GATA6
EP300.p2	-5.43	EP300
BACH2.p2	-5.43	BACH2
TFCP2.p2	-5.17	TFCP2
TAL1_TCF{3,4,12}.p2	-4.99	TAL1..
FOXO1,3,4.p2	-4.98	FOXO1,3,4
HOX{A5,B5}.p2	4.91	HOXA5,B5

STAT5{A,B}.p2	-4.79	STAT5A,B
TLX1..3_NFIC{dimer}.p2	-4.63	TLX1..3..
FOXL1.p2	-4.47	FOXL1
GLI1..3.p2	-4.38	GLI1..3
ZNF384.p2	-4.35	ZNF384
SPI1.p2	-4.32	SPI1
POU5F1_SOX2{dimer}.p2	4.08	POU5F1..
RXRA_VDR{dimer}.p2	3.84	RXRA..
STAT2,4,6.p2	-3.65	STAT2,4,6
ESR1.p2	3.63	ESR1
HOX{A4,D4}.p2	3.60	HOXA4,D4
EOMES.p2	-3.51	EOMES
MAZ.p2	-3.20	MAZ
NANOG.p2	3.19	NANOG
CTCF.p2	3.10	CTCF
FEV.p2	3.07	FEV
CEBPA,B_DDIT3.p2	3.04	CEBPA,B..
FOXQ1.p2	-3.02	FOXQ1
LMO2.p2	-2.78	LMO2
POU6F1.p2	2.76	POU6F1
NKX2-3_NKX2-5.p2	2.74	NKX2-3..
CDX1,2,4.p2	-2.70	CDX1,2,4
AR.p2	-2.65	AR
HIF1A.p2	2.63	HIF1A
TGIF1.p2	-2.50	TGIF1
NANOG{mouse}.p2	2.43	NANOGmo..
GFI1.p2	2.34	GFI1
NKX3-1.p2	-2.30	NKX3-1
LHX3,4.p2	2.29	LHX3,4
ZFP161.p2	-2.22	ZFP161
NFIL3.p2	2.18	NFIL3
ATF4.p2	2.16	ATF4
ALX1.p2	-2.08	ALX1
IKZF1.p2	2.03	IKZF1
TFAP2{A,C}.p2	-1.91	TFAP2A,C
FOS_FOS{B,L1}_JUN{B,D}.p2	-1.83	FOS..
PPARG.p2	-1.78	PPARG
VSX1,2.p2	-1.70	VSX1,2
NKX2-2,8.p2	-1.64	NKX2-2,8
HOXA9_MEIS1.p2	-1.58	HOXA9..
ZBTB6.p2	-1.47	ZBTB6
RREB1.p2	1.46	RREB1
CUX2.p2	-1.46	CUX2
ONECUT1,2.p2	-1.46	ONECUT1,2
SREBF1,2.p2	-1.40	SREBF1,2
PDX1.p2	1.34	PDX1
MTF1.p2	-1.25	MTF1
NKX2-1,4.p2	-1.23	NKX2-1,4
DMAP1_NCOR{1,2}_SMARC.p2	-1.20	..SMARC

RFX1..5_RFXANK_RFXAP.p2	-1.19	RFX1..5..
POU5F1.p2	-1.18	POU5F1
PAX6.p2	-1.14	PAX6
ATF5_CREB3.p2	-1.14	ATF5..
MAFB.p2	-1.13	MAFB
TBX4,5.p2	1.07	TBX4,5
RXRG_dimer.p3	1.07	RXRG..
CREB1.p2	1.06	CREB1
AIRE.p2	1.03	AIRE
FOX{F1,F2,J1}.p2	-0.99	FOXF1,F..
EVI1.p2	-0.97	EVI1
EHF.p2	-0.95	EHF
NFY{A,B,C}.p2	0.93	NFYA,B,C
GTF2A1,2.p2	-0.93	GTF2A1,2
MYB.p2	-0.90	MYB
XBP1.p3	-0.90	XBP1
MYOD1.p2	-0.89	MYOD1
HBP1_HMGB_SSRP1_UBTF.p2	-0.87	HBP1..
ESRRA.p2	0.86	ESRRA
HMGA1,2.p2	0.86	HMGA1,2
JUN.p2	0.86	JUN
ZNF423.p2	-0.86	ZNF423
KLF12.p2	0.84	KLF12
ZNF148.p2	0.79	ZNF148
SRY.p2	-0.78	SRY
SOX2.p2	-0.77	SOX2
SRF.p3	0.76	SRF
MSX1,2.p2	-0.75	MSX1,2
RXR{A,B,G}.p2	0.72	RXRA,B,G
GFI1B.p2	-0.72	GFI1B
FOX{C1,C2}.p2	0.71	FOXC1,C2
HNF1A.p2	0.71	HNF1A
MYBL2.p2	0.67	MYBL2
NR3C1.p2	0.64	NR3C1
ZNF238.p2	0.61	ZNF238
EBF1.p2	0.58	EBF1
EN1,2.p2	-0.54	EN1,2
NR6A1.p2	-0.53	NR6A1
NKX6-1,2.p2	0.51	NKX6-1,2
PAX8.p2	0.50	PAX8
NFIX.p2	-0.49	NFIX
NFE2L1.p2	-0.48	NFE2L1
FOXP3.p2	-0.47	FOXP3
EWSR1-FLI1.p2	0.45	EWSR1-F..
T.p2	-0.42	T
SPIB.p2	0.41	SPIB
FOXA2.p3	0.40	FOXA2
NR5A1,2.p2	0.39	NR5A1,2
KLF4.p3	-0.38	KLF4

PAX3,7.p2	0.37	PAX3,7
PBX1.p2	-0.36	PBX1
ATF2.p2	-0.35	ATF2
SOX{8,9,10}.p2	0.35	SOX8,9,10
MYFfamily.p2	0.34	MYFfamily
RORA.p2	0.33	RORA
ATF6.p2	0.33	ATF6
TBP.p2	0.33	TBP
ZIC1..3.p2	0.32	ZIC1..3
LEF1_TCF7_TCF7L1,2.p2	-0.32	LEF1..
SOX17.p2	-0.31	SOX17
MEF2{A,B,C,D}.p2	0.30	MEF2A,B..
ARID5B.p2	0.29	ARID5B
YY1.p2	-0.29	YY1
GTF2I.p2	-0.27	GTF2I
NHLH1,2.p2	0.25	NHLH1,2
POU2F1..3.p2	-0.25	POU2F1..3
CDC5L.p2	0.25	CDC5L
TFAP4.p2	-0.23	TFAP4
POU3F1..4.p2	0.22	POU3F1..4
EGR1..3.p2	0.22	EGR1..3
NFATC1..3.p2	0.22	NFATC1..3
HNF4A_NR2F1,2.p2	-0.21	HNF4A..
SMAD1..7,9.p2	-0.21	SMAD1....
CRX.p2	-0.21	CRX
GZF1.p2	-0.20	GZF1
NR1H4.p2	-0.20	NR1H4
PRRX1,2.p2	-0.19	PRRX1,2
HSF1,2.p2	-0.18	HSF1,2
TLX2.p2	0.18	TLX2
HAND1,2.p2	0.16	HAND1,2
ELF1,2,4.p2	0.16	ELF1,2,4
TP53.p2	0.15	TP53
NKX3-2.p2	-0.15	NKX3-2
POU1F1.p2	-0.14	POU1F1
FOSL2.p2	-0.14	FOSL2
IKZF2.p2	0.14	IKZF2
HLF.p2	0.14	HLF
DBP.p2	-0.09	DBP
TCF4_dimer.p2	0.09	TCF4..
ADNP_IRX_SIX_ZHX.p2	0.08	ADNP..
STAT1,3.p3	-0.08	STAT1,3
RUNX1..3.p2	-0.08	RUNX1..3
BPTF.p2	0.04	BPTF

Table 5. Five experiments combined MARA results **including only the miR AAGUGCU seed family** ranked by absolute activity z-values.

name	zvalue	abbreviation
AAGUGCU	-42.07	miR-294
AAAGUGC	-34.37	miR-17-..
IRF1,2,7.p3	-18.27	IRF1,2,7
bHLH_family.p2	17.04	bHLH..
TFEB.p2	-13.34	TFEB
AAGGCAC	-13.22	miR-124
ARNT_ARNT2_BHLHB2_MAX_MYC_USF1.p2	12.86	ARNT..
PRDM1.p3	-12.50	PRDM1
HIC1.p2	-12.04	HIC1
NFKB1_REL_RELA.p2	-11.35	NFKB1..
UCAAGUA	-11.23	miR-26a..
CAGUGCA	-10.32	miR-148..
PAX5.p2	-10.26	PAX5
AGCACCA	10.07	miR-29a..
HES1.p2	9.49	HES1
TFDP1.p2	9.43	TFDP1
SP1.p2	-9.37	SP1
AHR_ARNT_ARNT2.p2	9.08	AHR..
GUGCAAA	-8.91	miR-19a..
SPZ1.p2	-8.60	SPZ1
ZNF143.p2	8.57	ZNF143
ELK1,4_GABP{A,B1}.p3	8.50	ELK1,4..
NRF1.p2	8.27	NRF1
FOXD3.p2	8.21	FOXD3
HMX1.p2	8.16	HMX1
FOX{D1,D2}.p2	-7.92	FOXD1,D2
GUAGUGU	-7.67	miR-142..
PITX1..3.p2	7.48	PITX1..3
TEAD1.p2	-7.30	TEAD1
HOX{A6,A7,B6,B7}.p2	-7.27	HOXA6,A..
SOX5.p2	7.19	SOX5
GGAAGAC	7.02	miR-7a-7b
AGUGCAA	-7.01	miR-130..
E2F1..5.p2	6.98	E2F1..5
PAX2.p2	-6.63	PAX2
SNAI1..3.p2	-6.55	SNAI1..3
PATZ1.p2	6.48	PATZ1
ZEB1.p2	6.44	ZEB1
TFAP2B.p2	-6.40	TFAP2B
MZF1.p2	-6.35	MZF1
NFE2.p2	-6.32	NFE2
FOXN1.p2	-6.27	FOXN1
FOX{I1,J2}.p2	-6.24	FOXI1,J2
AGCAGCA	-6.10	miR-15a..
ETS1,2.p2	-5.99	ETS1,2
PAX4.p2	-5.98	PAX4
GATA1..3.p2	-5.88	GATA1..3
AGUGGUU	-5.78	miR-140..

CUUUGGU	-5.69	miR-9
NFE2L2.p2	5.50	NFE2L2
EP300.p2	-5.47	EP300
FOXO1,3,4.p2	-5.47	FOXO1,3,4
RBPJ.p2	-5.45	RBPJ
ZBTB16.p2	5.43	ZBTB16
GGCUCAG	5.35	miR-24
BACH2.p2	-5.29	BACH2
TAL1_TCF{3,4,12}.p2	-5.14	TAL1..
GATA6.p2	5.14	GATA6
TFCP2.p2	-5.04	TFCP2
AAGGUGC	-5.02	miR-18a..
UGUGCUU	4.98	miR-218
AAUACUG	-4.83	miR-200..
GAGGUAG	4.77	let-7a-..
STAT5{A,B}.p2	-4.66	STAT5A,B
FOXL1.p2	-4.56	FOXL1
CACAGUG	-4.49	miR-128
TGIF1.p2	-4.42	TGIF1
TLX1..3_NFIC{dimer}.p2	-4.39	TLX1..3..
ZNF384.p2	-4.28	ZNF384
HOX{A5,B5}.p2	4.25	HOXA5,B5
GLI1..3.p2	-4.17	GLI1..3
STAT2,4,6.p2	-3.97	STAT2,4,6
UUGGCAC	-3.97	miR-96
GUAAACA	-3.82	miR-30a..
CCCUGAG	-3.78	miR-125..
SPI1.p2	-3.78	SPI1
POU5F1_SOX2{dimer}.p2	3.72	POU5F1..
AGCAGCG	3.61	miR-503
AUGGCAC	-3.58	miR-183
GCAGCAU	3.55	miR-103..
RXRA_VDR{dimer}.p2	3.53	RXRA..
ESR1.p2	3.52	ESR1
MAZ.p2	-3.33	MAZ
HOX{A4,D4}.p2	3.31	HOXA4,D4
EOMES.p2	-3.25	EOMES
UCCCUUU	3.24	miR-204..
ACAGUAC	-3.21	miR-101..
FEV.p2	3.20	FEV
AGCUGCC	3.14	miR-22
HIF1A.p2	3.07	HIF1A
NANOG.p2	3.06	NANOG
CTCF.p2	2.98	CTCF
GCUGGUG	2.87	miR-138
NKX2-3_NKX2-5.p2	2.85	NKX2-3..
LMO2.p2	-2.85	LMO2
GUCAGUU	-2.84	miR-223
FOXQ1.p2	-2.83	FOXQ1

CDX1,2,4.p2	-2.81	CDX1,2,4
AGCUUAU	-2.77	miR-21-..
POU6F1.p2	2.77	POU6F1
AACACUG	-2.76	miR-141..
REST.p3	2.67	REST
CCAGUGU	-2.67	miR-199..
GFI1.p2	2.58	GFI1
CCUUCAU	-2.49	miR-205
GGAAUGU	-2.49	miR-1a-..
CEBPA,B_DDIT3.p2	2.45	CEBPA,B..
ACCCUGU	2.36	miR-10a..
AR.p2	-2.31	AR
UCCAGUU	-2.30	miR-145
ATF4.p2	2.28	ATF4
NKX3-1.p2	-2.22	NKX3-1
CCAGCAU	2.21	miR-338..
UGCAUAG	2.13	miR-153
NFIL3.p2	2.13	NFIL3
AUGGCUU	2.12	miR-135..
IKZF1.p2	2.12	IKZF1
UCACAUU	2.11	miR-23a..
LHX3,4.p2	2.05	LHX3,4
FOS_FOS{B,L1}_JUN{B,D}.p2	-2.05	FOS..
ALX1.p2	-2.02	ALX1
NANOG{mouse}.p2	1.92	NANOGmo..
GUAACAG	-1.87	miR-194
CUCCCAA	1.86	miR-150..
ZFP161.p2	-1.86	ZFP161
UAAGACU	-1.84	miR-499
UAAGACG	-1.83	miR-208..
TFAP2{A,C}.p2	-1.76	TFAP2A,C
GAUCAGA	-1.75	miR-383
PPARG.p2	-1.75	PPARG
GCUACAU	-1.67	miR-221..
SRY.p2	-1.65	SRY
RREB1.p2	1.63	RREB1
SREBF1,2.p2	-1.59	SREBF1,2
ONECUT1,2.p2	-1.58	ONECUT1,2
UAAUGCU	-1.56	miR-155
AAUCUCU	1.55	miR-216b
NKX2-2,8.p2	-1.53	NKX2-2,8
GGCAAGA	-1.50	miR-31
VSX1,2.p2	-1.46	VSX1,2
HOXA9_MEIS1.p2	-1.41	HOXA9..
RFX1..5_RFXANK_RFXAP.p2	-1.38	RFX1..5..
DMAP1_NCOR{1,2}_SMARC.p2	-1.34	..SMARC
UGACCUA	1.28	miR-192..
CUX2.p2	-1.28	CUX2
CUACAGU	-1.27	miR-139..

POU5F1.p2	-1.24	POU5F1
ZBTB6.p2	-1.22	ZBTB6
AGGUAGU	1.17	miR-196..
AAUGCCC	-1.15	miR-365
MAFB.p2	-1.14	MAFB
AACGGAA	1.13	miR-191
UGAAAUG	-1.12	miR-203
PDX1.p2	1.09	PDX1
NKX2-1,4.p2	-1.08	NKX2-1,4
ATF5_CREB3.p2	-1.08	ATF5..
UUUUUGC	1.06	miR-129..
AACAGUC	-1.05	miR-132..
PAX6.p2	-1.03	PAX6
EVI1.p2	-1.01	EVI1
AIRE.p2	1.01	AIRE
CREB1.p2	1.01	CREB1
AAUCUCA	0.97	miR-216a
HMGA1,2.p2	0.96	HMGA1,2
AUGACAC	0.95	miR-425..
EHF.p2	-0.93	EHF
NFY{A,B,C}.p2	0.92	NFYA,B,C
FOX{F1,F2,J1}.p2	-0.92	FOXF1,F..
RXRG_dimer.p3	0.89	RXRG..
MYB.p2	-0.89	MYB
GTF2A1,2.p2	-0.89	GTF2A1,2
ESRRA.p2	0.88	ESRRA
CAGCAGG	0.88	miR-214..
JUN.p2	0.88	JUN
ACAUUCA	-0.87	miR-181..
CGUACCG	0.86	miR-126..
TBX4,5.p2	0.86	TBX4,5
XBP1.p3	-0.85	XBP1
KLF12.p2	0.83	KLF12
FOX{C1,C2}.p2	0.83	FOXC1,C2
AUUGCAC	-0.82	miR-25-..
SPIB.p2	0.82	SPIB
GGAGUGU	0.82	miR-122
MYOD1.p2	-0.79	MYOD1
RXR{A,B,G}.p2	0.78	RXRA,B,G
AACCUGG	-0.78	miR-490..
SRF.p3	0.78	SRF
UCACAGU	0.77	miR-27a..
UUGGUCC	0.77	miR-133..
UGUGCGU	0.73	miR-210
MYBL2.p2	0.72	MYBL2
HBP1_HMGB_SSRP1_UBTF.p2	-0.72	HBP1..
GAGAACU	-0.72	miR-146..
MSX1,2.p2	-0.71	MSX1,2
ZNF423.p2	-0.70	ZNF423

ZNF148.p2	0.69	ZNF148
SOX2.p2	-0.68	SOX2
HNF1A.p2	0.68	HNF1A
GFI1B.p2	-0.66	GFI1B
CRX.p2	-0.61	CRX
MTF1.p2	-0.60	MTF1
NFE2L1.p2	-0.60	NFE2L1
FOXP3.p2	-0.58	FOXP3
NR3C1.p2	0.58	NR3C1
UUGUUCG	-0.57	miR-375
EN1,2.p2	-0.55	EN1,2
NKX6-1,2.p2	0.55	NKX6-1,2
ZNF238.p2	0.53	ZNF238
PAX8.p2	0.52	PAX8
ACUGCAU	-0.49	miR-217
EWSR1-FLI1.p2	0.47	EWSR1-F..
NR6A1.p2	-0.45	NR6A1
UGCAUUG	0.44	miR-33
FOXA2.p3	0.43	FOXA2
NFIX.p2	-0.41	NFIX
UUGGCAA	0.40	miR-182
PBX1.p2	-0.39	PBX1
EBF1.p2	0.38	EBF1
SMAD1..7,9.p2	-0.37	SMAD1....
T.p2	-0.35	T
ARID5B.p2	0.32	ARID5B
PAX3,7.p2	0.32	PAX3,7
TBP.p2	0.32	TBP
TP53.p2	0.31	TP53
ACUGGCC	0.31	miR-193..
MYFfamily.p2	0.31	MYFfamily
NR5A1,2.p2	0.30	NR5A1,2
MEF2{A,B,C,D}.p2	0.29	MEF2A,B..
GAGAUGA	0.29	miR-143
GAUUGUC	-0.27	miR-219..
ATF6.p2	0.27	ATF6
ZIC1..3.p2	0.27	ZIC1..3
GZF1.p2	-0.26	GZF1
NFATC1..3.p2	0.26	NFATC1..3
LEF1_TCF7_TCF7L1,2.p2	-0.26	LEF1..
YY1.p2	-0.26	YY1
POU3F1..4.p2	0.26	POU3F1..4
HNF4A_NR2F1,2.p2	-0.25	HNF4A..
EGR1..3.p2	0.24	EGR1..3
KLF4.p3	-0.24	KLF4
SOX17.p2	-0.24	SOX17
SOX{8,9,10}.p2	0.23	SOX8,9,10
FOSL2.p2	-0.23	FOSL2
NHLH1,2.p2	0.22	NHLH1,2

TLX2.p2	0.22	TLX2
IKZF2.p2	0.21	IKZF2
TFAP4.p2	-0.21	TFAP4
ATF2.p2	-0.20	ATF2
NR1H4.p2	-0.20	NR1H4
HSF1,2.p2	-0.19	HSF1,2
UAUUGCU	-0.18	miR-137
RUNX1..3.p2	-0.17	RUNX1..3
TCF4_dimer.p2	0.17	TCF4..
AACCGUU	0.17	miR-451
POU2F1..3.p2	-0.17	POU2F1..3
CDC5L.p2	0.17	CDC5L
DBP.p2	-0.16	DBP
POU1F1.p2	-0.15	POU1F1
CGUGUCU	0.14	miR-187
HLF.p2	0.13	HLF
ADNP_IRX_SIX_ZHX.p2	0.12	ADNP..
NKX3-2.p2	-0.11	NKX3-2
STAT1,3.p3	0.11	STAT1,3
ELF1,2,4.p2	0.11	ELF1,2,4
GGACGGA	-0.10	miR-184
PRRX1,2.p2	0.09	PRRX1,2
BPTF.p2	0.04	BPTF
GTF2I.p2	0.04	GTF2I
GAUAUGU	-0.03	miR-190..
GGCAGUG	-0.03	miR-34a..
HAND1,2.p2	0.02	HAND1,2
RORA.p2	-0.01	RORA
ACAGUAU	-0.00	miR-144
ACCCGUA	-0.00	miR-99a..

Table 6. Five experiments combined MARA results **including all miRNA seed families** ranked by absolute activity z-values.

motif abbreviation	motif name	motif binding genes
TEAD1	TEAD1.p2	Tead2, Tead1, Tead4, Tead3
EOMES	EOMES.p2	Eomes
KLF4	KLF4.p3	Klf4
POU5F1..	POU5F1_SOX2{dimer}.p2	Sox2, Pou5f1
ADNP..	ADNP_IRX_SIX_ZHX.p2	Zhx3, Adnp, Zhx1, Irx4, Zhx2, Six2, Irx5, Six5
HOXA4,D4	HOX{A4,D4}.p2	Hoxd4, Hoxa4
BACH2	BACH2.p2	Bach2
POU3F1..4	POU3F1..4.p2	Pou3f4, Pou3f2, Pou3f3, Pou3f1
ZNF143	ZNF143.p2	Zfp143
MYFfamily	MYFfamily.p2	Myog, Myf5, Myf6, Myod1
NFE2	NFE2.p2	Nfe2
T	T.p2	T
NKX3-1	NKX3-1.p2	Nkx3-1
FOXA2	FOXA2.p3	Foxa2
CEBPA,B..	CEBPA,B_DDIT3.p2	Cebpb, Ddit3, Cebpa
EHF	EHF.p2	Ehf
HNF4A..	HNF4A_NR2F1,2.p2	Hnf4a, Nr2f1, Nr2f2
CRX	CRX.p2	Crx
TFDP1	TFDP1.p2	Tfdp1
GFI1B	GFI1B.p2	Gfi1b
STAT1,3	STAT1,3.p3	Stat3, Stat1
NKX3-2	NKX3-2.p2	Nkx3-2
STAT2,4,6	STAT2,4,6.p2	Stat4, Stat2, Stat6
RBPJ	RBPJ.p2	Rbpj
RREB1	RREB1.p2	Rreb1
FOS..	FOS_FOS{B,L1}_JUN{B,D}.p2	Junb, Fosl1, Fos, Fosb, Jund
SREBF1,2	SREBF1,2.p2	Srebf2, Srebf1
FOXL1	FOXL1.p2	Foxl1
HSF1,2	HSF1,2.p2	Hsf2, Hsf1
ARID5B	ARID5B.p2	Arid5b
GTF2I	GTF2I.p2	Gtf2i
ESRRA	ESRRA.p2	Esrra
ONECUT1,2	ONECUT1,2.p2	Onecut1, Onecut2
NKX2-3..	NKX2-3_NKX2-5.p2	Nkx2-5, Nkx2-3
GATA6	GATA6.p2	Gata6
ZBTB16	ZBTB16.p2	Zbtb16
AIRE	AIRE.p2	Aire
SMAD1....	SMAD1..7,9.p2	Smad4, Smad5, Smad9, Smad7, Smad6, Smad2, Smad3, Smad1
BPTF	BPTF.p2	Bptf
CDC5L	CDC5L.p2	Cdc5l

NKX6-1,2	NKX6-1,2.p2	Nkx6-2, Nkx6-1
NANOG	NANOG.p2	Nanog
PAX4	PAX4.p2	Pax4
NFYA,B,C	NFY{A,B,C}.p2	Nfya, Nfyb, Nfyc
EP300	EP300.p2	Ep300
TAL1..	TAL1_TCF{3,4,12}.p2	Tcf4, Tcf12, Tcf3, Tal1
GZF1	GZF1.p2	Gzf1
ATF4	ATF4.p2	Atf4
PAX3,7	PAX3,7.p2	Pax7, Pax3
NKX2-2,8	NKX2-2,8.p2	Nkx2-2, Nkx2-9
AHR..	AHR_ARNT_ARNT2.p2	Ahr, Arnt, Arnt2
NFE2L1	NFE2L1.p2	Nfe2l1
MYB	MYB.p2	Myb
NFIX	NFIX.p2	Nfix
ELK1,4..	ELK1,4_GABP{A,B1}.p3	Elk1, Gabpa, Gabpb1, Elk4
KLF12	KLF12.p2	Klf12
SPZ1	SPZ1.p2	Spz1
GFI1	GFI1.p2	Gfi1
MAZ	MAZ.p2	Maz
PRDM1	PRDM1.p3	Prdm1
PAX8	PAX8.p2	Pax8
HIC1	HIC1.p2	Hic1
FOSL2	FOSL2.p2	Fosl2
EWSR1-F..	EWSR1-FLI1.p2	Fli1, Ewsr1
TP53	TP53.p2	Trp53
FOXN1	FOXN1.p2	Foxn1
JUN	JUN.p2	Junb, Jun, Jund
AR	AR.p2	Ar
ZNF423	ZNF423.p2	Zfp423
FOXC1,C2	FOX{C1,C2}.p2	Foxc1, Foxc2
VSX1,2	VSX1,2.p2	Vsx1, Vsx2
MZF1	MZF1.p2	Mzf1
SP1	SP1.p2	Sp1
ELF1,2,4	ELF1,2,4.p2	Elf4, Elf1, Elf2
SOX5	SOX5.p2	Sox5
XBP1	XBP1.p3	Xbp1
REST	REST.p3	Rest
TFAP4	TFAP4.p2	Tcfap4
ETS1,2	ETS1,2.p2	Ets2, Ets1
NR3C1	NR3C1.p2	Nr3c1
HMGA1,2	HMGA1,2.p2	Hmga1, Hmga2
EN1,2	EN1,2.p2	En2, En1
ALX1	ALX1.p2	Alx1
ZNF384	ZNF384.p2	Zfp384
HOXA5,B5	HOX{A5,B5}.p2	Hoxa5, Hoxb5
IKZF1	IKZF1.p2	Ikzf1
TCF4..	TCF4_dimer.p2	Tcf4
CUX2	CUX2.p2	Cux2

IRF1,2,7	IRF1,2,7.p3	Irf2, Irf1, Irf7
HBP1..	HBP1_HMGB_SSRP1_UBTF.p2	Ssrp1, Hmgb3, Hmgb2, Hbp1, Ubtf
TLX2	TLX2.p2	Tlx2
SRF	SRF.p3	Srf
HMX1	HMX1.p2	Hmx1
MEF2A,B..	MEF2{A,B,C,D}.p2	Mef2a, Mef2c, Mef2d, Mef2b
GLI1..3	GLI1..3.p2	Gli2, Gli1, Gli3
NKX2-1,4	NKX2-1,4.p2	Nkx2-4, Nkx2-1
FOXQ1	FOXQ1.p2	Foxq1
TBP	TBP.p2	Tbp
TLX1..3..	TLX1..3_NFIC{dimer}.p2	Tlx1, Tlx3
PBX1	PBX1.p2	Pbx1
EGR1..3	EGR1..3.p2	Egr1, Egr2, Egr3
PDX1	PDX1.p2	Pdx1
ESR1	ESR1.p2	Esr1
LHX3,4	LHX3,4.p2	Lhx4, Lhx3
ZNF148	ZNF148.p2	Zfp148
HLF	HLF.p2	Hlf
FOXI1,J2	FOX{I1,J2}.p2	Foxi1, Foxj2
SPIB	SPIB.p2	Spib
FEV	FEV.p2	Fev
NFIL3	NFIL3.p2	Nfil3
NFE2L2	NFE2L2.p2	Nfe2l2
MAFB	MAFB.p2	Mafb
ATF2	ATF2.p2	Atf2
HOXA6,A..	HOX{A6,A7,B6,B7}.p2	Hoxb6, Hoxb7, Hoxa6, Hoxa7
GTF2A1,2	GTF2A1,2.p2	Gtf2a1, Gtf2a2
TFEB	TFEB.p2	Tcfeb
SRY	SRY.p2	Sry
TGIF1	TGIF1.p2	Tgif1
RORA	RORA.p2	Rora
SNAI1..3	SNAI1..3.p2	Snai2, Snai3, Snai1
HNF1A	HNF1A.p2	Hnf1a
RXRA,B,G	RXR{A,B,G}.p2	Rxrb, Rxrg, Rxra
TFCP2	TFCP2.p2	Tcfcp2
IKZF2	IKZF2.p2	Ikzf2
NR1H4	NR1H4.p2	Nr1h4
ZIC1..3	ZIC1..3.p2	Zic3, Zic2, Zic1
SPI1	SPI1.p2	Sfpi1
POU1F1	POU1F1.p2	Pou1f1
NR5A1,2	NR5A1,2.p2	Nr5a2, Nr5a1
NFKB1..	NFKB1_REL_RELA.p2	Rel, Rela, Nfkb1
CDX1,2,4	CDX1,2,4.p2	Cdx1, Cdx2, Cdx4
FOXF1,F..	FOX{F1,F2,J1}.p2	Foxj1, Foxf1a, Foxf2
TFAP2A,C	TFAP2{A,C}.p2	Tcfap2a, Tcfap2c
NFATC1..3	NFATC1..3.p2	Nfatc2, Nfatc1, Nfatc3

ZFP161	ZFP161.p2	Zfp161
ATF6	ATF6.p2	Atf6
MYOD1	MYOD1.p2	Myod1
ARNT..	ARNT_ARNT2_BHLHB2_MAX_MYC_USF1.p2	Myc, Bhlhe40, Arnt, Arnt2, Usf1, Max
STAT5A,B	STAT5{A,B}.p2	Stat5a, Stat5b
FOXD1,D2	FOX{D1,D2}.p2	Foxd1, Foxd2
POU2F1..3	POU2F1..3.p2	Pou2f2, Pou2f1, Pou2f3
HES1	HES1.p2	Hes1
EVI1	EVI1.p2	Mecom
PRRX1,2	PRRX1,2.p2	Prrx2, Prrx1
FOXD3	FOXD3.p2	Foxd3
RXRA..	RXRA_VDR{dimer}.p2	Vdr
ZBTB6	ZBTB6.p2	Zbtb6
RUNX1..3	RUNX1..3.p2	Runx1, Runx2, Runx3
ZNF238	ZNF238.p2	Zfp238
PATZ1	PATZ1.p2	Patz1
LMO2	LMO2.p2	Lmo2
DBP	DBP.p2	Dbp
CTCF	CTCF.p2	Ctcf
PAX6	PAX6.p2	Pax6
PAX5	PAX5.p2	Pax5
PPARG	PPARG.p2	Pparg
PAX2	PAX2.p2	Pax2
CREB1	CREB1.p2	Creb1
NRF1	NRF1.p2	Nrf1
ZEB1	ZEB1.p2	Zeb1
YY1	YY1.p2	Yy1
NHLH1,2	NHLH1,2.p2	Nhlh1, Nhlh2
SOX17	SOX17.p2	Sox17
TBX4,5	TBX4,5.p2	Tbx5, Tbx4
..SMARC	DMAP1_NCOR{1,2}_SMARC.p2	Ncor2, Ncor1, Smarca1, Smarca5, Smarcc2, Dmap1
MYBL2	MYBL2.p2	Mybl2
RXRG..	RXRG_dimer.p3	Pparg, Rxrb, Rxrg, Ppara, Rxra, Nr1h2
PITX1..3	PITX1..3.p2	Pitx3, Pitx2, Pitx1
HOXA9..	HOXA9_MEIS1.p2	Meis1, Hoxa9
ATF5..	ATF5_CREB3.p2	Atf5, Creb3
SOX8,9,10	SOX{8,9,10}.p2	Sox8, Sox9, Sox10
POU6F1	POU6F1.p2	Pou6f1
POU5F1	POU5F1.p2	Pou5f1
MSX1,2	MSX1,2.p2	Msx2, Msx1
bHLH..	bHLH_family.p2	Hey2, Hey1, Olig2, Heyl, Id1, Mxi1, Mitf, Clock, Tcfe3, Mnt, Arntl, Mlxipl, Olig1, Mxd4, Arntl2, Npas2, Mxd3, Hes6

GATA1..3	GATA1..3.p2	Gata3, Gata1, Gata2
TFAP2B	TFAP2B.p2	Tcfap2b
EBF1	EBF1.p2	Ebf1
MTF1	MTF1.p2	Mtf1
FOXO1,3,4	FOXO1,3,4.p2	Foxo4, Foxo1, Foxo3
E2F1..5	E2F1..5.p2	E2f2, E2f5, E2f3, E2f4, E2f1
LEF1..	LEF1_TCF7_TCF7L1,2.p2	Lef1, Tcf7l2, Tcf7l1, Tcf7
HIF1A	HIF1A.p2	Hif1a
RFX1..5..	RFX1..5_RFXANK_RFXAP.p2	Rfx3, Rfxank, Rfx1, Rfx2, Rfxap, Rfx4, Rfx5
SOX2	SOX2.p2	Sox2
NANOGmo..	NANOG{mouse}.p2	Nanog
NR6A1	NR6A1.p2	Nr6a1
FOXP3	FOXP3.p2	Foxp3
HAND1,2	HAND1,2.p2	Hand2, Hand1

Table 7. Motif information table - Motif name, motif name abbreviation and transcription factor(s) binding the motif.

Name	Motif	Abbr	zvalue
Irf2	IRF1,2,7.p3	IRF1,2,7	-17.49
Mxd3	bHLH_family.p2	bHLH..	16.54
Clock	bHLH_family.p2	bHLH..	16.54
E2f5	E2F1..5.p2	E2F1..5	6.98

Table 8. AAGUGCU seed family transcription factor targets as predicted by combined MARA - Transcription factors consistently predicted (within all five experiments) by MARA to be a direct target of miR-294 and whose absolute motif activity z-value is > 5 (due to the presence of AAGUGCU seed family miRNAs).

Gene	Orientation	Cloning Primers
Arnt2	Forward	GAATTCCTCGAGCCACTGGCAACCAAGCACA
Arnt2	Reverse	CAGGACATAAGCGGCCGCCTCAAGTTGATCAATTACCAA
E2f5	Forward	GAATTGCTCGAGATAATGAAGGAGTTTGTGATCTGTT
E2f5	Reverse	AGGACATATGCGGCCGCTCAGTTGTAATACAGAGATAGTGCAT
Foxj2	Forward	GATGTAGCTCGAGATTCGAGAGAGGGAAATCTCACTT
Foxj2	Reverse	GAGTGAAATGCGGCCGCGGAAACCAAAGGGAAGCTGT
Irf2	Forward	GTATCTCTCGAGCCCGTGTCAAGAGCTGTTAA
Irf2	Reverse	CAGGAGAAATGCGGCCGCCATGATTACGCTCTAAGTAGACACA
Mxd3	Forward	GAATTCCTCGAGCGGGAGCACAGCTACTCA
Mxd3	Reverse	CAGGACATAAGCGGCCGCAGTGCGCAGGTGATAGACTGTA
Smarcc2	Forward	GAATTCCTCGAGCTCAGCCTGAAGAGTTCATCACTA
Smarcc2	Reverse	GACCAGAAAGCGGCCGCCTGCCTAGCAGCCACAGCTAA
Zfp238	Forward	CAAACTCTCGAGGTACGGTCTAAAAGCAGTCTTGTT
Zfp238	Reverse	TAAACTGCGGCCGCCAAATCTGTTGTGCGACTAT

Table 9. Primers used for cloning

Gene	Orientation	Mutagenesis Primers
Arnt2	Forward	GGCTTCCAAGAACAGCAAACTCGTCTCTCTCTTAGCC
Arnt2	Reverse	GGCTAAGAGAGAGACGAGTTTGCTGTTCTTGGAAGCC
E2f5	Forward	GTGAAGTGCCTTCTGTTTTAGAAGCCTATCAGTTTGTTGAC
E2f5	Reverse	GTCAACAAACTGATAGGCTTCTAAAACAGAAGGCACTTCAC
Foxj2	Forward	GCAGTTCACTAAAGAGTTATTTCTTTGTAAGG
Foxj2	Reverse	CCTTACAAAGAAATAACTCTTTAGTGAACTGC
Irf2	Forward	GCACCTTATCTTGAAGTACAATAGGCCTTCTTG
Irf2	Reverse	CAAGAAGGCCTATTGTACTTCAAGATAAGGTGC
Mxd3	Forward	GGAATTTCATGTAGCGGCCCTGCTTTGCTGC
Mxd3	Reverse	GCAGCAAAGCAGGGCCGCTACATGAAATTCC
Smarcc2	Forward	CCTCAAGTTTGAAAAGCAGCACCTACTTTTGACAG
Smarcc2	Reverse	CTGTCAAAAGTAGGTGCTGCTTTTCAAACTTGAGG
Zfp238	Forward	GTTGGGATCTTAACTTGTTTTTGTAGAATAATAGCATGAGAATCTCAC
Zfp238	Reverse	GTGAGATTCTCATGCTATTATTCTACAAAAACAAGTTAAGATCCCAAC

Table 10. Primers used for mutagenesis.

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