

# Bioinformatics prognosis of the interaction of miRNAs, piRNAs with human mRNA genes having di- and trinucleotide repeats

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**Table S1.** Characteristics miRNA interaction with 3'UTR mRNAs of genes having GU and AC dinucleotide repeats and associated with neurodegenerative diseases

Gene	miRNA	Start of BS, nt	$\Delta G$ , kJ/mol	$\Delta G/\Delta G_m$ , %	nt repeat	Disease [PMID]
ADCYAP1R1	miR-466	3844÷3854 (6)	-106	91	GU	Autism spectrum disorders [30556326]; Parkinson disease [29230633]; Schizophrenia [28125634]; Depressive disorders [23280952]
	ID00436.3p-miR	3844÷3854 (6)	-104	89		
BACH1	miR-466	4257÷4267 (6)	-106	91	GU	Alzheimer's disease [15068237]
	ID00436.3p-miR	4257÷4267 (6)	-104	89		
CACNG8	miR-466	6808÷6818 (6)	-106	91	GU	Schizophrenia [27102562]
	ID00436.3p-miR	6808÷6818 (6)	-104	89		
CD2AP	miR-466	2830÷2848 (10)	-106	91	GU	Mental depression [28630404]; Schizophrenia, Alzheimer's disease [30126816]
	ID00436.3p-miR	2830÷2848 (10)	-104	89		
CD36	miR-466	3533÷3539 (4)	-106	91	GU	Schizophrenia [22765916]
	ID00436.3p-miR	3533÷3541 (5)	-104	89		
HPS4	miR-466	3985÷3999 (8)	-106	91	GU	Schizophrenia [24168225]
	ID00436.3p-miR	3985÷4001 (9)	-104	89		
PCK1	miR-466	2391÷2401 (6)	-106	91	GU	Schizophrenia [18460190]
	ID00436.3p-miR	2391÷2403 (7)	-104	89		
SAMD4A	miR-466	4192÷4202 (6)	-106	91	GU	Schizophrenia [27846195]
	ID00436.3p-miR	4192÷4204 (7)	-104	89		
SH3PXD2A	miR-466	8610÷8616 (4)	-106	91	GU	Schizophrenia [24936775]
	ID00436.3p-miR	8610÷8616 (4)	-104	89		
VAPB	miR-466	2524÷2536 (7)	-106	91	GU	Amyotrophic lateral sclerosis [29628370]; Schizophrenia [19165527]
	ID00436.3p-miR	2524÷2536 (7)	-104	89		
AMOTL1	miR-574-5p	6023÷6037 (8)	-113	93	AC	Schizophrenia [22440650]; Alzheimer's disease [27075728]
	ID00470.5p-miR	6023÷6037 (8)	-108	89		
BTBD9	miR-574-5p	5797÷5821 (13)	-113	93	AC	Schizophrenia [23361623]
	ID00470.5p-miR	5797÷5821 (13)	-108	89		
C10orf71	miR-574-5p	4719÷4733 (8)	-113	93	AC	Alzheimer's disease [26830138]
	ID00470.5p-miR	4719÷4733 (8)	-108	89		

<i>DPYSL5</i>	miR-574-5p	2933÷2945 (7)	-113	93	AC	Alzheimer's disease [31233825]; Neurodevelopmental disorders [31446906];
	ID00470.5p-miR	2933÷2945 (7)	-108	89		
<i>FOXN3</i>	miR-574-5p	2428÷2444 (9)	-113	93	AC	Schizophrenia [21926974]
	ID00470.5p-miR	2428÷2444 (9)	-108	89		

Note: In parentheses indicate the number of miRNAs BSs

**Table S2.** Characteristics of miRNAs binding with 3'UTR mRNAs of genes having GU and AC dinucleotide repeats and associated with oncological diseases.

Gene	miRNA	Start of BS, nt	$\Delta G$ , kJ/mole	$\Delta G/\Delta G_m$ , %	nt repeat	Disease [PMID]
<i>ABLIM1</i>	miR-466	4473÷4499 (14)	-106	91	GU	Adrenal cortical adenoma [19218281]
	ID00436.3p-miR	4473÷4499 (14)	-104	89		
<i>BAZ2A</i>	miR-466	6857÷6869 (7)	-106	91	GU	Neuroblastoma [30064522]
	ID00436.3p-miR	6857÷6869 (7)	-104	89		
<i>CBX3</i>	miR-466	1307÷1313 (4)	-106	91	GU	Malignant neoplasms [30942427]
	ID00436.3p-miR	1307÷1313 (4)	-104	89		
<i>CD3EAP</i>	miR-466	3087÷3093 (4)	-106	91	GU	Malignant neoplasms [23624123]
	ID00436.3p-miR	3087÷3095 (6)	-104	89		
<i>CDK6</i>	miR-466	1910÷1918 (5)	-106	91	GU	Neuroblastoma [29073265]
	ID00436.3p-miR	1910÷1918 (5)	-104	89		
<i>REEP3</i>	miR-466	3839÷3857 (10)	-106	91	GU	Neuroblastoma [29042551]
	ID00436.3p-miR	3839÷3857 (10)	-104	89		
<i>ANO8</i>	miR-574-5p	4031÷4041 (6)	-113	93	AC	Malignant neoplasm of breast [20852631]
	ID00470.5p-miR	4031÷4041 (6)	-108	89		
<i>ARHGAP35</i>	miR-574-5p	7732÷7740 (5)	-113	93	AC	Malignant neoplasms [29934311]; Colorectal carcinoma [31332286]
	ID00470.5p-miR	7732÷7740 (5)	-108	89		
<i>ARRB1</i>	miR-574-5p	6399÷6415 (9)	-113	93	AC	Neoplasms [28442265]; Malignant neoplasm of breast [21497294]
	ID00470.5p-miR	6399÷6415 (9)	-108	89		
<i>BDH1</i>	miR-574-5p	2611÷2621 (6)	-113	93	AC	Malignant neoplasm of breast [23082721]; Malignant neoplasms [28025230]
	ID00470.5p-miR	2611÷2621 (6)	-108	89		
<i>DOK6</i>	miR-574-5p	7831÷7851 (11)	-113	93	AC	Malignant neoplasms [31486300]
	ID00470.5p-miR	7831÷7851 (11)	-108	89		
<i>E2F8</i>	miR-574-5p	3286÷3292 (4)	-113	93	AC	Malignant neoplasm of skin [27452520]; Liver carcinoma [28284560]
	ID00470.5p-miR	3286÷3292 (4)	-108	89		
<i>EHD3</i>	miR-574-5p	2274÷2284 (6)	-113	93	AC	Brain neoplasms [24306026]; Malignant neoplasms [31646426]; Liver carcinoma [28284560]
	ID00470.5p-miR	2274÷2284 (6)	-108	89		
<i>FAM163A</i>	miR-574-5p	2108÷2122 (8)	-113	93	AC	Malignant neoplasms [19671756]; Neoplasms, neuroblastoma [31496741]
	ID00470.5p-miR	2108÷2122 (8)	-108	89		
<i>GLI2</i>	miR-574-5p	6124÷6144 (11)	-113	93	AC	Malignant neoplasm of breast [31535669]
	ID00470.5p-miR	6124÷6144 (11)	-108	89		
<i>MNT</i>	miR-574-5p	4275÷4281 (4)	-113	93	AC	Malignant neoplasm of breast [16928695]; Malignant neoplasms [17577784]
	ID00470.5p-miR	4275÷4281 (4)	-108	89		
<i>WNT4</i>	miR-574-5p	1981÷1999 (10)	-113	93	AC	Malignant neoplasm of breast [30194396]; Malignant Neoplasms, carcinoma [29429512]
	ID00470.5p-miR	1981÷1999 (10)	-108	89		
<i>ZRANB1</i>	miR-574-5p	3799÷3807 (5)	-113	93	AC	Malignant neoplasm of breast [29669287]; Liver carcinoma [30686098]
	ID00470.5p-miR	3799÷3807 (5)	-108	89		

**Table S3.** Characteristics of miRNAs binding with 3'UTR mRNAs of genes having GU and AC dinucleotide repeats and associated with diabetes diseases

Gene	miRNA	Start of BS, nt	$\Delta G$ , kJ/mol	$\Delta G/\Delta G_m$ , %	nt repeat	Disease [PMID]
<i>BACH2</i>	miR-466 ID00436.3p-miR	5579÷5605 (14) 5579÷5605 (14)	-106 -104	91 89	GU	Diabetes [30970177]; Diabetes mellitus, Insulin-dependent [24608439]
<i>FASLG</i>	miR-466 ID00436.3p-miR	1604÷1612 (5) 1604÷1612 (5)	-106 -104	91 89	GU	Diabetes mellitus, experimental [19820199]; Diabetes mellitus, insulin-dependent [17324464]
<i>HEMGN</i>	miR-466 ID00436.3p-miR	1844÷1850 (4) 1844÷1850 (4)	-106 -104	91 89	GU	Diabetes [28337877]; Diabetic Retinopathy [31275351]
<i>IGF2R</i>	miR-466 ID00436.3p-miR	8447÷8455 (5) 8447÷8457 (6)	-106 -104	91 89	GU	Diabetes [21852217]; Diabetes mellitus, non-insulin-dependent [18602895]
<i>ACVR2B</i>	miR-574-5p ID00470.5p-miR	10963÷11013 (26) 10963÷11013 (26)	-113 -108	93 89	AC	Diabetes mellitus, non-insulin-dependent [11334431]
<i>AFF3</i>	miR-574-5p ID00470.5p-miR	4208÷4214 (4) 4208÷4214 (4)	-113 -108	93 89	AC	Diabetes mellitus, insulin dependent [25751624] Diabetic retinopathy [28779365]
<i>CAMK2N1</i>	miR-574-5p ID00470.5p-miR	1850÷1862 (7) 1850÷1862 (7)	-113 -108	93 89	AC	Diabetes mellitus, non-insulin-dependent [31327268]
<i>EP300</i>	miR-574-5p ID00470.5p-miR	8566÷8584 (10) 8566÷8584 (10)	-113 -108	93 89	AC	Diabetes mellitus [28886276]; [22228707]; Diabetic nephropathy [28444663]
<i>FAM167A</i>	miR-574-5p ID00470.5p-miR	3152÷3160 (5) 3152÷3160 (5)	-113 -108	93 89	AC	Diabetes mellitus, insulin dependent [21765104]

**Table S4.** Characteristics piRNA and miRNA interaction with 5'UTR mRNAs of genes having trinucleotide repeats and associated with diseases

Genes	piRNA, miRNA	5'UTR positions, nt	Energy, kJ/mol	Score, %	piRNA, miRNA length, nt
<i>BCL11A</i>	piR-33638	177-189	-161	90	29
	piR-65782	179-197	-140	96	24
	ID00296.3p-miR	176-191	-142	91	25
	ID01702.3p-miR	179-194	-140	93	24
	piR-28385	180-192	-151	93	26
	piR-478	185-191	-153	92	28
	ID01895.5p-miR	181-187	-136	91	24
	ID02653.3p-miR	181-190	-113	85	22
	ID00756.3p-miR	182-188	-127	92	23
	miR-3960	181-193	-115	92	20
<i>BCL2L11</i>	piR-44682	54-93	-146	90	26
	piR-71189	67-79	-142	83	28
	piR-28514	67-91	-142	84	30
	ID00296.3p-miR	54-90	-134	85	25
	ID01702.3p-miR	54-90	-127	85	24
	miR-3960	56-92	-106	85	20
<i>GLS</i>	piR-16206	51-75	-121	85	26
	piR-hsa-70378	54-87	-140	87	28
	ID00372.5p-miR	53-77	-113	83	24
	miR-1322	54-87	-89	87	19
<i>GNB2</i>	piR-33638	72-93	-166	93	29
	piR-28812	74-95	-140	86	27
	piR-44682	74-98	-142	87	26
	piR-35158	75-87	-146	88	27
	piR-28513	78-90	-149	86	30
	ID00296.3p-miR	68-98	-136	86	25
	ID01804.3p-miR	74-101	-134	91	23
	ID01641.3p-miR	74-98	-132	89	24
	ID01702.3p-miR	74-98	-136	90	24
	novel-miR-1983-5p	78-93	-108	82	21
<i>KIF3B</i>	piR-33638	44-68	-151	85	29
	piR-28812	46-70	-144	88	27
	piR-28513	47-65	-144	84	30
	piR-44682	49-73	-149	91	26
	piR-57937	54-63	-155	87	30
	ID01804.3p-miR	49-70	-127	87	23
	ID00296.3p-miR	49-73	-149	95	25
	ID01641.3p-miR	49-73	-138	93	24
	ID01702.3p-miR	49-76	-129	86	24
	miR-3960	48-75	-113	90	20
	novel-miR-1011-3p	55-73	-110	90	20
<i>MAB21L1</i>	piR-16206	337-373	-119	84	26

	piR-32860	337-379	-115	83	24
	ID00372.5p-miR	342-372	-113	83	24
	miR-1322	343-379	-89	87	19
<i>NDRG3</i>	piR-478	18-36	-138	83	28
	piR-28812	15-39	-142	87	27
	piR-28513	16-31	-142	83	30
	piR-35158	16-31	-144	87	27
	piR-71189	19-31	-142	83	28
	piR-57937	20-29	-149	83	30
	ID00756.3p-miR	15-39	-117	85	23
	ID01804.3p-miR	15-45	-123	84	23
	ID02294.5p-miR	17-38	-125	86	24
	ID01041.5p-miR	18-36	-123	84	24
	ID02064.5p-miR	19-40	-123	85	23
	ID01895.5p-miR	20-35	-123	83	24
	novel-miR-1983-5p	19-40	-108	82	21
<i>SBF1</i>	piR-33638	36-46	-155	87	29
	piR-28812	38-44	-136	83	27
	piR-44682	38-47	-149	91	26
	piR-28385	42-48	-151	93	26
	ID01041.5p-miR	38-47	-125	86	24
	ID01804.3p-miR	38-50	-140	96	23
	ID00756.3p-miR	41-47	-125	91	23
	ID02064.5p-miR	42-54	-123	85	23
	ID02256.3p-miR	42-48	-115	83	22
	ID00722.5p-miR	43-52	-106	88	20
	miR-3960	43-52	-115	92	20
<i>SMAD9</i>	piR-33638	51-69	-146	82	29
	piR-28385	51-72	-134	83	26
	piR-28812	56-65	-151	92	27
	piR-69429	57-69	-144	89	26
	ID03229.5p-miR	51-69	-125	94	22
	ID02294.5p-miR	52-64	-121	83	24
	ID00296.3p-miR	56-65	-136	86	25
	ID00756.3p-miR	56-65	-125	91	23
	ID02296.5p-miR	57-66	-102	83	20
	ID00061.3p-miR	58-67	-117	85	22
	miR-3960	58-70	-115	92	20
	novel-miR-1983-5p	57-66	-108	82	21
<i>WBP4</i>	piR-33638	67-91	-149	83	29
	piR-44682	69-96	-140	86	26
	piR-28385	70-97	-138	86	26
	piR-28812	72-90	-136	83	27
	piR-28513	76-82	-144	84	30
	piR-478	81-87	-138	83	28
	ID01662.3p-miR	72-87	-123	87	23

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ID00756.3p-miR	72-90	-115	83	23
ID00296.3p-miR	72-96	-129	82	25
ID01804.3p-miR	72-96	-125	86	23
miR-3960	74-95	-106	85	20
novel-miR-1983-5p	76-91	-108	82	21

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**Table S5.** Characteristics piRNA and miRNA interaction with CDS mRNAs of genes having trinucleotide repeats and associated with diseases

Genes	piRNA, miRNA	CDS positions, nt	Energy, kJ/mol	Score, %	piRNA, miRNA length, nt
<i>AR</i>	piR-32860	1281-1335	-127	92	24
	piR-70378	1281-1326	-140	86	28
	ID00372.5p-miR	1283-1331	-115	84	24
	piR-37021	2476-2512	-134	89	25
	piR-32860	2477-2513	-123	89	24
	novel-miR-1639-3p	2483-2516	-106	85	21
<i>ATN1</i>	piR-32860	1687-1726	-127	92	24
	piR-70378	1693-1720	-140	86	28
	ID00372.5p-miR	1701-1722	-113	83	24
<i>CASKIN1</i>	piR-33638	4059-4074	-149	83	29
	piR-28812	4061-4073	-140	86	27
	piR-74279	4065-4071	-142	89	26
	piR-28385	4065-4077	-151	93	26
	piR-28513	4065-4080	-149	86	30
	ID00296.3p-miR	4061-4076	-129	82	25
	ID01804.3p-miR	4061-4076	-129	88	23
	ID00457.3p-miR	4063-4078	-127	94	22
	ID01641.3p-miR	4064-4076	-125	84	24
	ID01702.3p-miR	4064-4079	-129	86	24
	miR-3960	4066-4078	-115	92	20
	novel-miR-1983-5p	4065-4077	-108	82	21
<i>DLX6</i>	piR-33638	126-138	-151	85	29
	piR-28385	126-144	-140	87	26
	piR-28513	129-135	-144	84	30
	ID01041.5p-miR	125-137	-125	86	24
	ID01804.3p-miR	128-143	-125	86	23
	ID00296.3p-miR	131-140	-136	86	25
	ID01702.3p-miR	131-146	-129	86	24
	miR-3960	130-145	-108	86	20
	novel-miR-1983-5p	129-141	-108	82	21
<i>DMRTA2</i>	piR-33638	1493-1505	-157	88	29
	piR-46279	1499-1508	-136	89	25
	ID01702.3p-miR	1495-1510	-125	83	24
	ID01041.5p-miR	1501-1507	-125	86	24
	ID01641.3p-miR	1501-1510	-125	84	24
	miR-3960	1500-1512	-104	83	20
<i>E2F4</i>	piR-70378	981-1008	-140	87	28
	ID00372.5p-miR	983-998	-113	83	24
	miR-1322	981-1008	-89	87	19
<i>FOXE1</i>	piR-478	1153-1174	-138	83	28

	piR-33638	1155-1176	-146	82	29
	ID02064.5p-miR	1165-1183	-123	85	23
	novel-miR-1983-5p	1162-1177	-113	85	21
<i>FOXF2</i>	piR-33638	199-211	-149	83	29
	piR-28385	205-214	-136	84	26
	ID01641.3p-miR	201-216	-129	87	24
	ID00296.3p-miR	201-216	-140	89	25
	ID02256.3p-miR	208-214	-121	88	22
	novel-miR-1983-5p	211-220	-108	82	21
<i>HTT</i>	piR-44682	249-345	-136	83	26
	piR-33638	253-265	-146	82	29
	piR-28812	255-267	-136	83	27
	piR-478	261-267	-140	85	28
	ID01804.3p-miR	255-270	-121	83	23
	ID01702.3p-miR	258-270	-125	83	24
	ID01641.3p-miR	258-348	-125	84	24
	miR-3960	260-272	-110	88	20
<i>IRF2BPL</i>	piR-33638	1355-1373	-146	82	29
	piR-47476	1358-1367	-140	85	27
	piR-28812	1360-1372	-136	83	27
	ID01041.5p-miR	1360-1372	-125	86	24
	ID01804.3p-miR	1360-1380	-125	86	23
	ID02294.5p-miR	1362-1374	-127	87	24
	ID00296.3p-miR	1363-1375	-138	88	25
	ID01641.3p-miR	1363-1375	-127	86	24
	ID01702.3p-miR	1363-1378	-132	87	24
	miR-3960	1362-1380	-104	83	20
	novel-miR-1639-3p	1170-1276	-108	86	21
<i>MAML3</i>	piR-32860	2208-3045	-119	86	24
	piR-70378	2214-2253	-136	84	28
	ID00372.5p-miR	2222-2225	-113	83	24
	miR-1322	2214-3048	-89	87	19
<i>MNX1</i>	piR-33638	661-679	-149	83	29
	piR-44682	663-684	-146	90	26
	piR-28812	666-678	-136	83	27
	piR-28513	670-676	-144	84	30
	ID01804.3p-miR	663-678	-125	86	23
	ID01041.5p-miR	666-678	-125	86	24
	ID01702.3p-miR	669-684	-125	83	24
	miR-3960	668-686	-104	83	20
	novel-miR-1983-5p	673-685	-108	82	21
<i>NKX2</i>	piR-33638	1004-1022	-159	89	29
	piR-28812	1006-1021	-136	83	27
	piR-44682	1009-1027	-142	87	26
	piR-28513	1010-1016	-142	83	30
	piR-28385	1010-1025	-144	89	26



	ID00296.3p-miR	1006-1024	-132	84	25
	ID01804.3p-miR	1006-1027	-127	87	23
	ID01895.5p-miR	1014-1020	-129	87	24
	ID00061.3p-miR	1017-1026	-117	85	22
	miR-3960	1011-1026	-108	86	20
	novel-miR-1983-5p	1013-1025	-110	84	21
<i>RAI1</i>	piR-32860	1301-1319	-127	92	24
	miR-1322	1301-1312	-89	87	19
	ID00372.5p-miR	1303-1318	-113	83	24
<i>SMARCA2</i>	piR-70378	754-808	-136	84	28
	ID03311.5p-miR	771-786	-100	85	21
	ID00372.5p-miR	777-783	-113	83	24
	miR-1322	745-808	-85	83	19
<i>TBP</i>	piR-70378	466-538	-136	84	28
	ID03311.5p-miR	468-540	-100	85	21
	ID00372.5p-miR	504-537	-113	83	24
	miR-1322	502-544	-89	87	19
<i>ZIC5</i>	piR-41532	711-747	-140	84	31
	piR-28511	735-741	-132	86	27
	piR-26901	737-743	-134	86	27
	piR-32860	789-798	-117	85	24
<i>ZIC5</i>	piR-44682	1313-1496	-142	87	26
	piR-33638	1367-1494	-155	87	29
	piR-478	1481-1499	-138	83	28
	piR-28812	1472-1490	-146	90	27
	piR-28513	1473-1494	-144	84	30
	piR-28385	1473-1500	-146	91	26
	piR-57937	1474-1486	-151	85	30
	piR-28514	1476-1491	-142	84	30
	ID01804.3p-miR	1313-1325	-121	83	23
	ID01641.3p-miR	1313-1496	-132	89	24
	ID00296.3p-miR	1313-1496	-142	91	25
	D00457.3p-miR	1471-1498	-121	89	22
	ID02294.5p-miR	1471-1592	-121	83	24
	ID01041.5p-miR	1472-1487	-125	86	24
	ID00756.3p-miR	1472-1493	-121	88	23
	ID01702.3p-miR	1472-1496	-125	83	24
	ID01804.3p-miR	1472-1499	-127	87	23
	novel-miR-1983-5p	1473-1491	-108	82	21
<i>ZNF384</i>	piR-32860	1661-1798	-115	83	24
	piR-16206	1771-1789	-119	84	26
	ID00372.5p-miR	1773-1791	-113	83	24
	miR-1322	1771-1801	-89	87	19
<i>ZNF703</i>	piR-478	1712-1724	-138	83	28
	piR-33638	1707-1716	-159	89	29
	piR-28385	1707-1719	-140	87	26

	ID01041.5p-miR	1706-1715	-125	86	24
	ID01804.3p-miR	1706-1721	-123	84	23
	ID00296.3p-miR	1709-1718	-136	86	25
	ID01702.3p-miR	1709-1721	-129	86	24
	novel-miR-1011-3p	1712-1718	-104	84	20
<i>ZSWIM6</i>	piR-33638	499-526	-157	88	29
	piR-28812	501-525	-138	84	27
	piR-44682	501-534	-151	92	26
	piR-28513	505-523	-144	84	30
	piR-69429	505-532	-140	87	26
	piR-65782	495-534	-122	84	24
	ID00296.3p-miR	501-528	-134	85	25
	ID01702.3p-miR	501-531	-127	85	24
	ID01804.3p-miR	501-531	-129	88	23
	ID02294.5p-miR	503-527	-121	83	24
	miR-3960	500-533	-106	85	20
	novel-miR-1011-3p	522-531	-104	84	20