

Table SI. Summary of database-annotation, experimental and clinical evidence supporting cancer-associated piRNAs.

Classification	Candidate	Cancer type	PIWI-binding validation	3' - 2' - O-Me / periodate oxidation	<i>In vitro</i> experiment	<i>In vivo</i> experiment	Clinical correlation/validation	Bioinformatic / sequencing-based analysis	(Refs.)
PIWI-bound and functionally validated piRNAs	piR-30188	Glioma	Yes	-	Yes	Yes	Yes	Yes	(123)
	piR-4447944	CRPC	Yes	-	Yes	Yes	Yes	Yes	(125)
	piR-54265	CRC	Yes	Yes	Yes	Yes	Yes	Yes	(23,182)
	piR-31115	ccRCC; TNBC	Yes	-	Yes	-	Yes	Yes	(130,183,184)
	piR-137463	LUAD	Yes	Yes	Yes	Yes	Yes	Yes	(134)
	piR-216911	HCC	Yes	-	Yes	Yes	Yes	Yes	(137)
	piR-57125	ccRCC	Yes	-	Yes	Yes	Yes	Yes	(167,173)
Partially validated piRNA-like RNAs	piR-1742	RCC	-	-	Yes	Yes	Yes	Yes	(99)
	piR-651	Breast cancer; NSCLC	-	-	Yes	Yes	Yes	-	(120,185)
	piR-823	CRC; breast cancer; MM; ESCC	-	-	Yes	Yes	Yes	Yes	(26,100,121,127,128,138,162,186,187)
	piR-36026	Breast cancer	-	-	Yes	Yes	Yes	-	(179,188)
	piR-MW557525	NB	-	-	Yes	Yes	Yes	Yes	(124,189)
	piR-35462	OSCC	-	-	Yes	Yes	Yes	Yes/limited	(126)
	piR-2158	Breast cancer	-	-	Yes	Yes	Yes	Yes	(129)
	piR-30937	PNEN	-	-	Yes	Yes	Yes	Yes	(132)
	piR-016658	Breast cancer	-	-	Yes/limited	-	-	-	(133)
	piR-016975	Breast cancer; HCC	-	-	Yes	Yes	Yes	Yes	(133,178)
	piR-35410	TNBC	-	-	Yes	Yes	Yes	-	(135)
	piR-26441	OC	-	-	Yes	Yes	Yes	-	(136)
	piR-36712	Breast cancer	-	-	Yes	Yes	Yes	Yes	(79)
	piR-017724	CRC; HCC	-	-	Yes (163)	-	Yes	Yes	(145,163)
	piR-211106	LUAD	-	Yes	Yes	Yes	Yes	Yes	(170)
	piR-30473	DLBCL	-	-	Yes	Yes	Yes	Yes	(171)
	piR-004800	MM	-	-	Yes	Yes	Yes	Yes/limited	(172)
	piR-001773	Prostate cancer	-	-	Yes	Yes	Yes	-	(174)

	piR-017184	Prostate cancer	-	-	Yes	Yes	Yes	-	(174)
	piR-YBX1	TNBC	-	-	Yes	Yes	Yes	Yes	(175)
	piR-28489	RCC	-	-	Yes	Yes	Yes	Yes	(177)
	piR-1245	CRC; GC	-	-	Yes	-	Yes	Yes (122)	(122,156)
	piR-001311	CRC	-	-	-	-	Yes	Yes	(145)
	piR-004153	CRC	-	-	-	-	Yes	Yes	(145)
	piR-017723	CRC	-	-	-	-	Yes	Yes	(145)
	piR-020365	CRC	-	-	-	-	Yes	Yes	(145)
	piR-020619	CRC	-	-	-	-	Yes	Yes	(147)
	piR-020450	CRC	-	-	-	-	Yes	Yes	(147)
	piR-5937	Colon cancer	-	-	-	-	Yes	Yes	(148)
	piR-28876	Colon cancer	-	-	-	-	Yes	Yes	(148)
	piR-002468	Prostate cancer	-	-	-	-	Yes	Yes	(157)
	piR-349843	Prostate cancer	-	-	-	-	Yes	Yes	(157)
	piR-382289	Prostate cancer	-	-	-	-	Yes	Yes	(157)
	piR-158533	Prostate cancer	-	-	-	-	Yes	Yes	(157)
	piR-164586	NSCLC	-	-	-	-	Yes	Yes	(149)
	piR-26925	LUAD	-	-	-	-	Yes	Yes	(150)
	piR-5444	LUAD	-	-	-	-	Yes	Yes	(150)
	piR-019308	GC	-	-	-	-	Yes	Yes	(155)
	piR-004918	GC	-	-	-	-	Yes	Yes	(155)
	piR-018569	GC	-	-	-	-	Yes	Yes	(155)
	piR-10506469	CCA; GBC	-	-	-	-	Yes	Yes	(151)
	piR-20548188	CCA; GBC	-	-	-	-	Yes	Yes	(151)
	piR-1029	HCC	-	-	-	-	Yes	Yes	(35)
	piR-15254	HCC	-	-	-	-	Yes	Yes	(35)
	piR-35395	HCC	-	-	-	-	Yes	Yes	(35)
	piR-32132	HCC	-	-	-	-	Yes	Yes	(35)
	piR-43597	HCC	-	-	-	-	Yes	Yes	(35)
	piR-162725	Pancreatic cancer	-	-	-	-	Yes	Yes	(34)
	piR-5936	Bladder cancer	-	-	-	-	Yes/limited	Yes	(152)
	piR-24000	CRC	-	-	-	-	Yes	Yes	(159)
	piR-18849	CRC	-	-	-	-	Yes	Yes	(160)
	piR-19521	CRC	-	-	-	-	Yes	Yes	(160)
	piR-000627	Prostate cancer	-	-	-	-	Yes	Yes	(169)
	piR-005553	Prostate cancer	-	-	-	-	Yes	Yes	(169)
	piR-019346	Prostate cancer	-	-	-	-	Yes	Yes/limited	(169)

	piR-48966 ^a	GC	-	-	-	-	Yes	Yes	(161)
	piR-49145	GC	-	-	-	-	Yes	Yes	(161)
	piR-31335 ^a	GC	-	-	-	-	Yes	Yes	(161)
	piR-13643	PTC	-	-	-	-	Yes	Yes	(164)
	piR-21238	PTC	-	-	-	-	Yes	Yes	(164)
	piR-23231	GBM	-	-	-	-	Yes	Yes	(165)
	piR-34536	ccRCC	-	-	-	-	Yes	Yes/limited	(166)
	piR-51810	ccRCC	-	-	-	-	Yes	Yes/limited	(166)
	piR-30924	ccRCC	-	-	-	-	Yes	Yes/limited	(167)
	piR-019822	NSCLC/LUSC	-	-	-	-	Yes	Yes	(168)
Database-annotated small-RNA candidates lacking sufficient experimental validation	piR-022710	NSCLC/LUSC	-	-	-	-	Yes	Yes	(168)
	piR-27200	Lung cancer	-	-	-	-	-	-	(113)
	piR- 31147	Renal cancer	-	-	-	-	-	-	(113)
	piR- 7806	Colon cancer	-	-	-	-	-	-	(113)
	piR- 9871	Breast cancer	-	-	-	-	-	-	(113)

piRNAa (named as piRNA clusters): piRNAs mainly originate from transposon-enriched genomic regions known as piRNA clusters, typically located in heterochromatic regions near centromeres or telomeres. piRNA, PIWI-interacting RNA; PIWI, P-element induced wimpy testis; PTC, papillary thyroid carcinoma; NSCLC, non-small cell lung cancer; LUSC, lung squamous cell carcinoma; LUAD, lung adenocarcinoma; GBM, glioblastoma; GBC, gallbladder carcinoma; CCA, cholangiocarcinoma; GC, gastric cancer; DLBCL, diffuse large B-cell lymphoma; OC, ovarian cancer; PNEN, pancreatic neuroendocrine neoplasm; OSCC, oral squamous cell carcinoma; NB, neuroblastoma; MM, multiple myeloma; ESCC, esophageal squamous cell carcinoma; HCC, hepatocellular carcinoma; ccRCC, clear cell renal cell carcinoma; TNBC, triple-negative breast cancer; CRC, colorectal cancer; CRPC, castration-resistant prostate cancer.