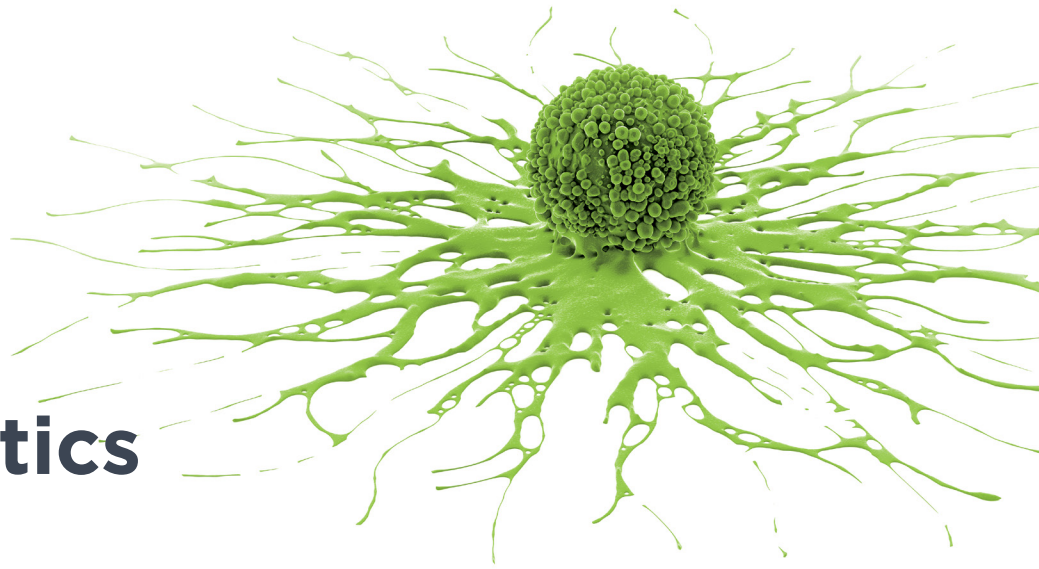


miREIA
miRNA Enzyme Immunoassay



microRNAs for Diagnostics in **Cancer**



A number of studies have demonstrated that microRNAs (miRNAs) act as tumor suppressors or oncogenes in human cancer. They also influence tumorigenesis enabling communication between cells within the tumor microenvironment. Extracellular miRNAs have potential as biomarkers for the prediction and prognosis of cancer in both solid tumors and hematologic malignancies.

miRNAs are a class of single-stranded non-coding RNA molecules with a length of 19-23 nucleotides. They play a role in negative post-transcriptional regulation by binding to complementary sequences on mRNA and blocking translation into proteins.

miRNAs are circulating in body fluids, stable and easily detectable. Therefore, miRNAs are new potential non-invasive biomarkers. Moreover, their use as therapeutic targets or tools for many diseases have been postulated.



QUANTITATIVE

- Sensitive
- Absolute quantification



ROBUST

- ELISA platform
- No reverse transcription
- No amplification



FAST

- 2-hours assay



AFFORDABLE

- Low cost per sample
- No special equipment

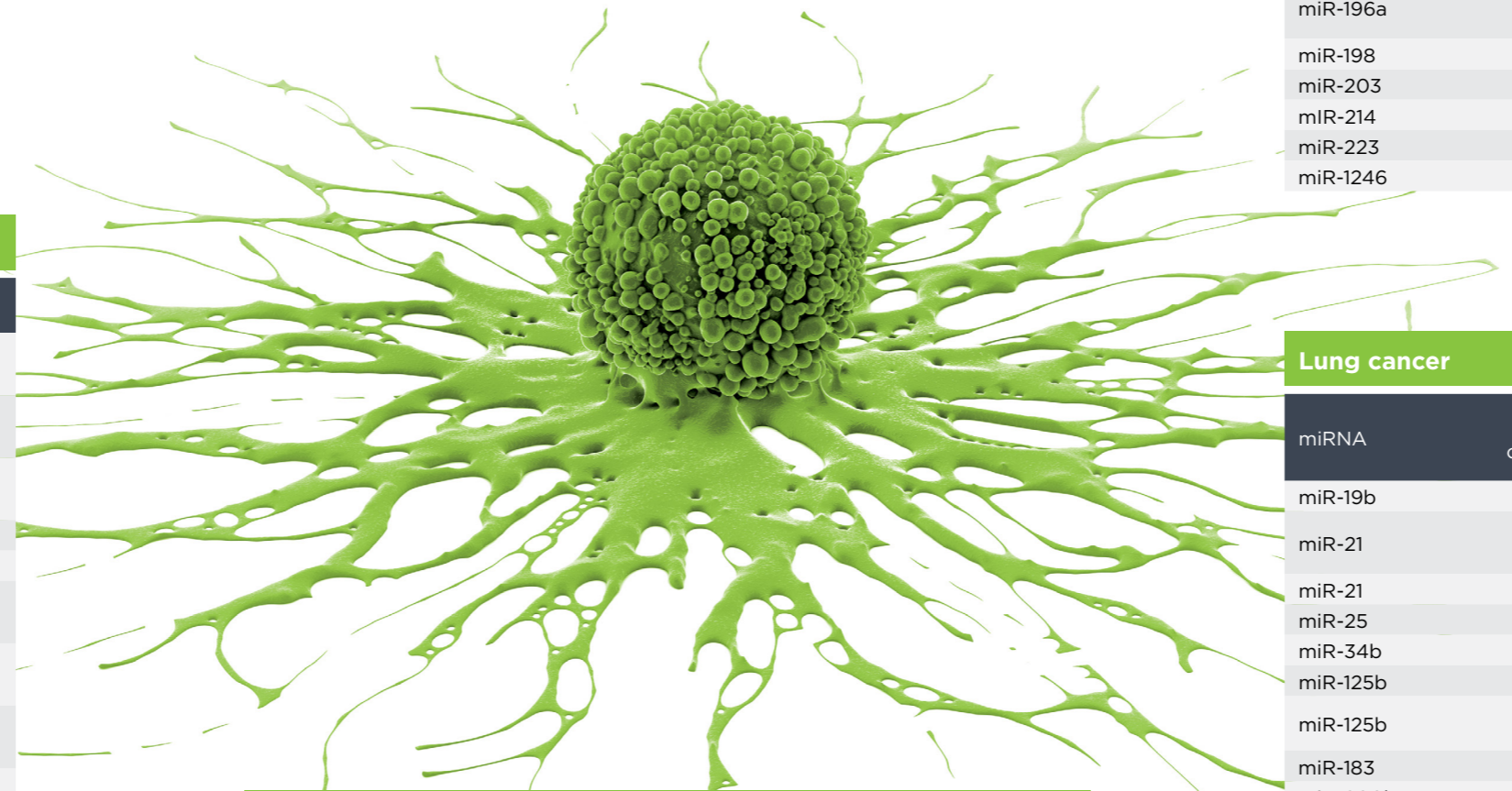
Circulating microRNAs associated with the diagnosis of selected cancers

Renal cell carcinoma			
miRNA	Direction of alteration	Value of biomarker	References
let-7 family	Increased	Diagnostic	1
miR-26b	Decreased	Diagnostic	2
miR-34a	Decreased	Diagnostic	3
miR-126-3p	Decreased	Diagnostic	4
miR-141	Decreased	Diagnostic	3
miR-144-3p	Increased	Diagnostic	5
miR-150-5p	Increased	Diagnostic	4
miR-210	Increased	Diagnostic	6, 7
miR-378	Increased	Diagnostic/ response prediction	8
miR-451	Decreased	Diagnostic	2
miR-449a	Increased	Diagnostic	4
miR-1233	Increased	Diagnostic	3, 4

Acute myeloid leukemia			
miRNA	Direction of alteration	Value of biomarker	References
miR-92a	Decreased	Diagnostic	9
miR-143	Decreased	Diagnostic	9
miR-199-5p	Increased	Diagnostic/ response to chemotherapy	10
miR-210	Increased	Prognostic/ diagnostic	11
miR-301b	Increased	Diagnostic/ response to chemotherapy	10
miR-326	Increased	Diagnostic/ response to chemotherapy	10
miR-342	Decreased	Diagnostic	9
miR-361-5p	Increased	Diagnostic	10
miR-625	Increased	Diagnostic/ response to chemotherapy	10
miR-655	Increased	Diagnostic/ response to chemotherapy	10

Pancreatic cancer			
miRNA	Direction of alteration	Value of biomarker	References
miR-1	Decreased	Diagnostic	38
miR-10b	Increased	Diagnostic	38
miR-17-5p	Increased	Prognostic	39
miR-21-5p	Increased	Diagnostic/ prognostic	40, 41
miR-25	Increased	Diagnostic	42
miR-30e	Increased	Diagnostic	43
miR-96	Decreased	Prognostic	44
miR-130b	Decreased	Prognostic	45
miR-141	Decreased	Prognostic	46
miR-143	Increased	Diagnostic	43
miR-155	Increased	Prognostic	47
miR-181c	Increased	Prognostic	48
miR-182-5p	Increased	Prognostic	44
miR-183	Decreased	Prognostic	49
miR-196a	Increased	Diagnostic/ prognostic	50, 51
miR-198	Decreased	Prognostic	49
miR-203	Increased	Prognostic	53
miR-214	Increased	Diagnostic	38
miR-223	Increased	Diagnostic	43
miR-1246	Increased	Diagnostic	51

Bladder cancer			
miRNA	Direction of alteration	Value of biomarker	References
miR-7-5p	Upregulated	Diagnostic/ Prognostic	15
miR-22-3p	Upregulated	Diagnostic/ Prognostic	15
miR-29a-3p	Upregulated	Diagnostic/ Prognostic	15, 16
miR-92a	Downregulated	Diagnostic	17, 18
miR-96	Upregulated	Diagnostic	19, 20
miR-100	Downregulated	Diagnostic/ Prognostic	17, 22, 23
miR-126-5p	Upregulated	Diagnostic/ Prognostic	15, 24
miR-143	Downregulated	Diagnostic/ Prognostic	17, 25, 26
miR-146a-5p	Upregulated	Diagnostic	27, 28
miR-148a	Downregulated	Prognostic	29
miR-155	Upregulated	Diagnostic/ Prognostic	30, 31
miR-186	Downregulated	Diagnostic	32
miR-200a-3p	Downregulated	Diagnostic/ Prognostic	15
miR-205	Upregulated	Diagnostic/ Prognostic	34, 35
miR-222	Upregulated	Diagnostic/ Prognostic	26, 36, 37
miR-375	Upregulated	Diagnostic/ Prognostic	15
miR-452	Upregulated	Diagnostic	26, 37



Chronic lymphocytic leukemia			
miRNA	Direction of alteration	Value of biomarker	References
miR-150	Increased	Poor prognosis	12
miR-192	Decreased	Diagnostic	13

Chronic myeloid leukemia			
miRNA	Direction of alteration	Value of biomarker	References
miR-372	Increased	Diagnostic	14
miR-375	Increased	Diagnostic	14

Lung cancer			
miRNA	Direction of alteration	Value of biomarker	References
miR-19b	Increased	Diagnostic	54
miR-21	Decreased	Response to therapy	55
miR-21	Increased	Diagnostic	56
miR-25	Decreased	Diagnostic	54
miR-34b	Increased	Diagnostic	57
miR-125b	Increased	Diagnostic	57
miR-125b	Decreased	Response to therapy	55
miR-183	Decreased	Diagnostic	54
miR-200b	Increased	Diagnostic	57
miR-203	Increased	Diagnostic	57
miR-205	Increased	Diagnostic	57
miR-224	Decreased	Response to therapy	55
miR-339-3p	Increased	Diagnostic	58
miR-339-5p	Decreased	Diagnostic	56
miR-425-3p	Increased	Diagnostic	58
miR-429	Increased	Diagnostic	57
miR-532	Decreased	Diagnostic	58
miR-574-5p	Increased	Diagnostic	59
miR-628-3p	Increased	Diagnostic	58
miR-1244	Increased	Diagnostic	60
miR-1254	Increased	Diagnostic	59

REFERENCES

1. Fedorko, Michal, et al. Detection of let-7 miRNAs in urine supernatant as potential diagnostic approach in non-metastatic clear-cell renal cell carcinoma. *Biochimica medica: Biochimica medica* 27.2 (2017): 411-417.
2. Chanudet, Estelle, et al. Large-scale genome-wide screening of circulating microRNAs in clear cell renal cell carcinoma reveals specific signatures in late-stage disease. *International journal of cancer* (2017).
3. Yadav, Siddharth, et al. Serum microRNA expression profiling: potential diagnostic implications of a panel of serum microRNAs for clear cell renal cell cancer. *Urology* 104 (2017): 64-69.
4. Butz, Henriett, et al. Exosomal microRNAs are diagnostic biomarkers and can mediate cell-cell communication in renal cell carcinoma. *European urology focus* 2.2 (2016): 210-218.
5. Lou, Ning, et al. miR-144-3p as a novel plasma diagnostic biomarker for clear cell renal cell carcinoma. *Urologic Oncology: Seminars and Original Investigations*. Vol. 35. No. 1. Elsevier, 2017.
6. Zhang, Wei, et al. MicroRNAs in serum exosomes as potential biomarkers in clear-cell renal cell carcinoma. *European urology focus* (2016).
7. Petrozza, Vincenzo, et al. Secreted miR-210-3p as non-invasive biomarker in clear cell renal cell carcinoma. *Oncotarget* 8.41 (2017): 69551.
8. Shi, Lixin, et al. Expression of serum microRNA-378 and its clinical significance in renal cell carcinoma. *Genetics and molecular biology* 40.2 (2017): 525-529.
9. Elhamamy, Amr Rafat, et al. Circulating miR-92a, miR-143 and miR-342 in Plasma are Novel Potential Biomarkers for Acute Myeloid Leukemia. *International journal of molecular and cellular medicine* 6.2 (2017): 77.
10. Koutova, Linda, et al. The impact of standard chemotherapy on miRNA signature in plasma in AML patients. *Leukemia research* 39.12 (2015): 1389-1395.
11. Tang, Xiaoqiong, et al. Overexpression of miR-210 is associated with poor prognosis of acute myeloid leukemia. *Medical science monitor: international medical journal of experimental and clinical research* 21 (2015): 3427.
12. Stamatopoulos, Basile, et al. Opposite prognostic significance of cellular and serum circulating MicroRNA-150 in patients with chronic lymphocytic leukemia. *Molecular medicine* 21.1 (2015): 123.
13. Fathullahzadeh, S., et al. Circulating microRNA-192 as a diagnostic biomarker in human chronic lymphocytic leukemia. *Cancer gene therapy* 23.10 (2016): 327.
14. Prinsloo, Andrea, Roger Pool, and Chantal Van Niekerk. Preliminary data on microRNA expression profiles in a group of South African patients diagnosed with chronic myeloid leukaemia. *Molecular and clinical oncology* 7.3 (2017): 386-390.
15. Du, Lutao, et al. Cell-free microRNA expression signatures in urine serve as novel noninvasive biomarkers for diagnosis and recurrence prediction of bladder cancer. *Oncotarget* 8.25 (2017): 40832.
16. Gao, Ji, et al. Identification and functional analysis of risk-related microRNAs for the prognosis of patients with bladder urothelial carcinoma. *Oncology letters* 14.6 (2017): 7297-7303.
17. Motawi, Tarek Kamal, et al. Circulating microRNAs, miR-92a, miR-100 and miR-143, as non-invasive biomarkers for bladder cancer diagnosis. *Cell biochemistry and function* 34.3 (2016): 142-148.
18. Adam, Liana, et al. Plasma microRNA profiles for bladder cancer detection. *Urologic Oncology: Seminars and Original Investigations*. Vol. 31. No. 8. Elsevier, 2013.
19. Eissa, Sanaa, et al. Evaluation of urinary miRNA-96 as a potential biomarker for bladder cancer diagnosis. *Medical Oncology* 32.1 (2015): 413.
20. Wu, Ziyu, et al. Upregulation of microRNA-96 and its oncogenic functions by targeting CDKN1A in bladder cancer. *Cancer cell international* 15.1 (2015): 107.
21. Wang, Sheng, et al. Reduced expression of microRNA-100 confers unfavorable prognosis in patients with bladder cancer. *Diagnostic pathology* 7.1 (2012): 159.
22. Cao, Y. H., et al. Prognostic role of microRNA-100 in patients with bladder cancer. *Genet Mol Res* 14.4 (2015): 15948-15954.
23. Jia, A. Y., et al. MicroRNA-126 inhibits invasion in bladder cancer via regulation of ADAM9. *British journal of cancer* 110.12 (2014): 2945.
24. Avgeris, Margaritis, et al. Uncovering the clinical utility of miR-143, miR-145 and miR-224 for predicting the survival of bladder cancer patients following treatment. *Carcinogenesis* 36.5 (2015): 528-537.
25. Puerta-Gil, Patricia, et al. miR-143, miR-222, and miR-452 are useful as tumor stratification and noninvasive diagnostic biomarkers for bladder cancer. *The American journal of pathology* 180.5 (2012): 1808-1815.
26. Mearini, Ettore, et al. Expression of urinary miRNAs targeting NLRs inflammasomes in bladder cancer. *Oncotargets and therapy* 10 (2017): 2665.
27. Sasaki, Hideo, et al. Expression level of urinary microRNA-146a-5p is increased in patients with bladder cancer and decreased in those after transurethral resection. *Clinical genitourinary cancer* 14.5 (2016): e493-e499.
28. Ma, Lin, et al. MicroRNA-148a represents an independent prognostic marker in bladder cancer. *Tumor Biology* 37.6 (2016): 7915-7920.
29. Zhang, Xin, et al. Direct quantitative detection for cell-free miR-155 in urine: a potential role in diagnosis and prognosis for non-muscle invasive bladder cancer. *Oncotarget* 7.3 (2016): 3255.
30. Wang, Hui, and Chang-Ping Men. Correlation of increased expression of microRNA-155 in bladder cancer and prognosis. *Laboratory medicine* 46.2 (2015): 118-122.
31. He, Xuefeng, Jigen Ping, and Duangai Wen. MicroRNA-186 regulates the invasion and metastasis of bladder cancer via vascular endothelial growth factor C. *Experimental and therapeutic medicine* 14.4 (2017): 3253-3258.
32. Yun, Seok Joong, et al. Cell-free microRNAs in urine as diagnostic and prognostic biomarkers of bladder cancer. *International journal of oncology* 41.5 (2012): 1871-1878.
33. Fang, Zhenqiang, et al. Circulating miR-205: a promising biomarker for the detection and prognosis evaluation of bladder cancer. *Tumor Biology* 37.6 (2016): 8075-8082.
34. Rateri, Nadine, et al. miRNA profiling identifies candidate mirnas for bladder cancer diagnosis and clinical outcome. *The Journal of molecular diagnostics* 15.5 (2013): 695-705.
35. Zhang, Dong-qing, et al. Increased expression of miR-222 is associated with poor prognosis in bladder cancer. *World journal of surgical oncology* 12.1 (2014): 241.(2012): 1808-1815.
36. Veerla, Srinivas, et al. MiRNA expression in urothelial carcinomas: important roles of miR-10a, miR-222, miR-125b, miR-7 and miR-452 for tumor stage and metastasis, and frequent homozygous losses of miR-31. *International journal of cancer* 124.9 (2009): 2236-2242.
37. Cheng, Qing, et al. Abnormal alterations of miR-1 and miR-214 are associated with clinicopathological features and prognosis of patients with PDAC. *Oncology letters* 14.4 (2017): 4605-4612.
38. Yu, Jun, et al. MicroRNA miR-17-5p is overexpressed in pancreatic cancer, associated with a poor prognosis, and involved in cancer cell proliferation and invasion. *Cancer biology & therapy* 10.8 (2010): 748-757.
39. Qu, Kai, et al. Circulating miRNA-21-5p as a diagnostic biomarker for pancreatic cancer: evidence from comprehensive miRNA expression profiling analysis and clinical validation. *Scientific reports* 7.1 (2017): 1692.
40. Hu, Geng-yuan, et al. Prognostic value of microRNA-21 in pancreatic ductal adenocarcinoma: a meta-analysis. *World journal of surgical oncology* 14.1 (2016): 82.
41. Deng, Ting, et al. Identification of circulating miR-25 as a potential biomarker for pancreatic cancer diagnosis. *Cellular Physiology and Biochemistry* 39.5 (2016): 1716-1722.
42. Debernardi, Silvana, et al. Noninvasive urinary miRNA biomarkers for early detection of pancreatic adenocarcinoma. *American journal of cancer research* 5.11 (2015): 3455.
43. Li, Chunlong, et al. GPC1 regulated by miR-96-5p, rather than miR-182-5p, in inhibition of pancreatic carcinoma cell proliferation. *International journal of molecular sciences* 15.4 (2014): 6314-6327.
44. Zhao, Gang, et al. MiR-130b is a prognostic marker and inhibits cell proliferation and invasion in pancreatic cancer through targeting STAT3. *PLoS one* 8.9 (2013): e73803.
45. Zhu, Zi-Man, et al. Prognostic significance of microRNA-141 expression and its tumor suppressor function in human pancreatic ductal adenocarcinoma. *Molecular and cellular biochemistry* 388.1-2 (2014): 39-49.
46. Papaconstantinou, Ioannis G., et al. Expression of microRNAs in patients with pancreatic cancer and its prognostic significance. *Pancreas* 42.1 (2013): 67-71.
47. Chen, Meiyuan, et al. Upregulation of miR-181c contributes to chemoresistance in pancreatic cancer by inactivating the Hippo signaling pathway. *Oncotarget* 6.42 (2015): 44466.
48. Zhou, Liang, et al. MicroRNA-183 is involved in cell proliferation, survival and poor prognosis in pancreatic ductal adenocarcinoma by regulating Bmi-1. *Oncology reports* 32.4 (2014): 1734-1740.
49. Kong, Xiangyu, et al. Detection of differentially expressed microRNAs in serum of pancreatic ductal adenocarcinoma patients: miR-196a could be a potential marker for poor prognosis. *Digestive diseases and sciences* 56.2 (2011): 602-609.
50. Xu, Yi-Fan, et al. Plasma exosome miR-196a and miR-1246 are potential indicators of localized pancreatic cancer. *Oncotarget* 8.44 (2017): 77028.
51. Ikenaga, Naoki, et al. MicroRNA-203 expression as a new prognostic marker of pancreatic adenocarcinoma. *Annals of surgical oncology* 17.12 (2010): 3120-3128.
52. Zaporozhchenko, Ivan A., et al. Plasma miR-19b and miR-183 as potential biomarkers of lung cancer. *PLoS one* 11.10 (2016): e0165261.
53. Xu, Xiaoyue, et al. MiRNA signature predicts the response of patients with advanced lung adenocarcinoma to platinum-based treatment. *Journal of cancer research and clinical oncology* 144.3 (2018): 431-438.
54. Sun, Yongpan, et al. Circulating microRNA-339-5p and-21 in plasma as an early detection predictors of lung adenocarcinoma. *Pathology-Research and Practice* (2017).
55. Halvorsen, Ann Rita, et al. A unique set of 6 circulating microRNAs for early detection of non-small cell lung cancer. *Oncotarget* 7.24 (2016): 37250.
56. Wang, Yang, et al. Identification of a three-miRNA signature as a blood-borne diagnostic marker for early diagnosis of lung adenocarcinoma. *Oncotarget* 7.18 (2016): 26070.
57. Foss, Kristen M., et al. miR-1254 and miR-574-5p: serum-based microRNA biomarkers for early-stage non-small cell lung cancer. *Journal of thoracic oncology* 6.3 (2011): 482-488.
58. Wang, Wenzhe, et al. Identification of miRNAs as non-invasive biomarkers for early diagnosis of lung cancers. *Tumor Biology* 37.12 (2016): 16287-16293.

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