

# miREIA

miRNA Enzyme Immunoassay



## microRNAs for Diagnostics in Metabolic Syndrome



microRNA (miRNAs) are a class of single-stranded non-coding RNA molecules with a length of 19-23 nucleotides. They are known to regulate expression of genes at the post-transcriptional level, via either degradation of target mRNA or inhibitory translation into protein.

miRNAs can be released into circulation due to necrosis or apoptosis, or actively secreted from living cells. The profile of circulating miRNAs is thus not random and reflects physiological and pathological status of the tissue. miRNAs show a high degree of stability in circulation which makes them ideal biomarkers.

Metabolic syndrome (MetS) is a complex disorder that arises from insulin resistance accompanied by altered fat deposition and adipose tissue function. MetS individuals often feature hypertension, dyslipidemia and have significantly higher risks for accelerated atherosclerosis, T2DM, cardiovascular and cancer diseases.

Circulating microRNAs found in blood change with the physiological condition of the organism and may help to: (1) identify people at risk of developing metabolic disease, (2) diagnose diabetes or other metabolic disorders on the basis of their etiology, (3) predict the development of complications, and (4) monitor response to treatment. <sup>[21]</sup>



### QUANTITATIVE

- Sensitive
- Absolute quantification



### ROBUST

- ELISA platform
- No reverse transcription
- No amplification



### FAST

- 2-hours assay



### AFFORDABLE

- Low cost per sample
- No special equipment

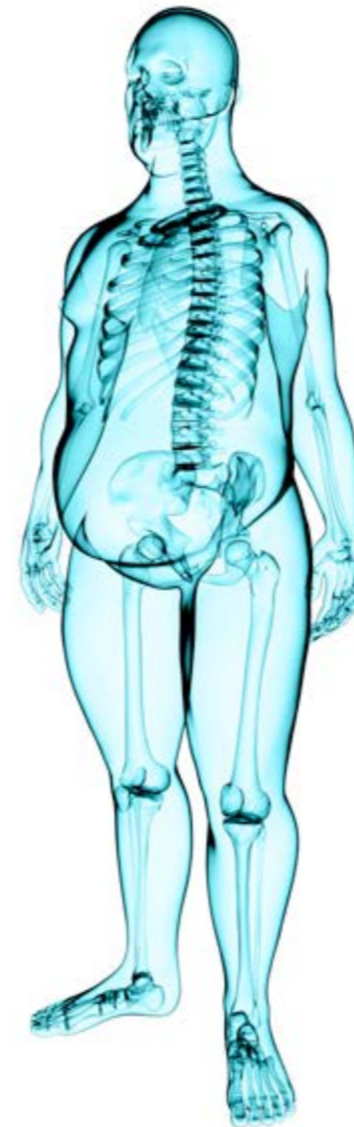
# Circulating microRNAs associated with the diagnosis of various MetS

Bariatric surgery		
miRNA	Direction of alteration	References
miR-7-5p	Increased	6
miR-15a-5p	Increased	6
miR-16	Decreased	13
miR-21-5p	Increased	8
miR-34a	Decreased	6
miR-106b-5p	Increased	6
miR-122-5p	Decreased	6, 7
miR-125b-5p	Decreased	8, 13
miR-130b-3p	Increased	8
miR-135b-5p	Decreased	6
miR-140-5p	Decreased	8
miR-142-3p	Decreased	8
miR-146a	Increased	8
miR-221-3p	Increased	8
miR-320a	Decreased	7
miR-423-5p	Increased	8

T2DM			
miRNA	Direction of alteration	Value of biomarker	References
miR-9	Increased	Diagnostic	1
miR-15a	Decreased	Prognostic	3, 21
miR-17-5p	Decreased	Diagnostic	4, 8, 10
miR-20b-5p	Decreased	Diagnostic	3, 8
miR-21-5p	Decreased	Prognostic	3
miR-24	Decreased	Prognostic	3
miR-27a-3p	Increased	Diagnostic	4, 8
miR-28-3p	Increased	Prognostic	3
miR-29a-3p	Increased	Diagnostic	1, 8
miR-34a	Increased	Diagnostic	1, 14
miR-122-5p	Increased	Prognostic/ Diagnostic	9
miR-125b	Increased	Diagnostic	14
miR-126	Decreased	prognostic	3, 8, 17
miR-140-5p	Increased	Diagnostic	17, 21
miR-142-3p	Increased	Diagnostic	8, 17, 21
miR-144	Increased	Diagnostic	11
miR-146a	Increased	Diagnostic	1
miR-150-5p	Increased	Diagnostic	8
miR-150-5p	Decreased	Diagnostic	3
miR-192	Decreased	Diagnostic	17, 21
miR-191	Decreased	prognostic	3
miR-195	Decreased	Diagnostic	17
miR-197-3p	Decreased	Diagnostic	3, 8
miR-222-3p	Increased	Diagnostic	8, 21
miR-223	Decreased	Prognostic	3
miR-320a	Increased	Diagnostic	4, 8
miR-320a	Decreased	Diagnostic	3
miR-375	Increased	Diagnostic	1, 8
miR-423-5p	Decreased	Diagnostic	17, 21
miR-486	Decreased	Prognostic	3
miR-652-3p	Decreased	Diagnostic	8

Hypercholesterolemia			
miRNA	Direction of alteration	Value of biomarker	References
miR-17	Increased	Diagnostic	4
miR-23a-3p	Increased	Diagnostic	4
miR-103	Decreased	Diagnostic	4
miR-132	Decreased	Diagnostic	10
miR-183	Increased	Diagnostic	4
miR-197-3p	Increased	Diagnostic	4
miR-509-5p	Increased	Diagnostic	4

Obesity			
miRNA	Direction of alteration	Value of biomarker	References
miR-17-5p	Decreased		10
miR-21-5p	Decreased		8
miR-23-3p	Decreased	Prognostic/ Diagnostic	5
miR-27a-3p	Decreased	Prognostic/ Diagnostic	5
miR-103-5p	Decreased		8
miR-122-5p	Increased	Diagnostic	2
miR-125-5p	Decreased		8
miR-130a-3p	Decreased	Prognostic/ Diagnostic	5
miR-130b	Increased		15, 16, 17, 21
miR-132	Decreased		10
miR-140-3p	Increased		8, 21
miR-142-3p	Increased		8, 15, 16, 17, 21
miR-197-3p	Decreased	Prognostic/ Diagnostic	5
miR-221-3p	Decreased		5, 8, 15, 16, 17
miR-222-3p	Increased		8, 16, 17, 21
miR-320a	Decreased	Prognostic/ Diagnostic	5
miR-423-5p	Decreased		16, 17, 21
miR-574-5p	Increased		2
miR-636	Increased		2
miR-933	Increased		2



Insulin resistance		
miRNA	Direction of alteration	References
miR-16	Decreased	12
miR-107	Decreased	12
miR-133	Decreased	12
miR-150	Decreased	12
miR-222	Decreased	12, 17
miR-103	Increased	19
miR-143	Increased	19
miR-486	Decreased	20

Hypertension			
miRNA	Direction of alteration	Value of biomarker	References
miR-23a-3p	Decreased	Diagnostic	4
miR-27a-3p	Decreased	Diagnostic	4, 18
miR-92a	Increased	Diagnostic	4
miR-130a	Increased	Diagnostic	4
miR-195	Increased	Diagnostic	4
miR-197-3p	Decreased	Diagnostic	4

## REFERENCES

1. Kong, Lei, et al. Significance of serum microRNAs in pre-diabetes and newly diagnosed type 2 diabetes: a clinical study. *Acta diabetologica* 48.1 (2011): 61-69.
2. Wang, Rui, et al. Elevated circulating microRNA-122 is associated with obesity and insulin resistance in young adults. *European journal of endocrinology* 172.3 (2015): 291-300.
3. Zampetaki, Anna, et al. Plasma MicroRNA profiling reveals loss of endothelial MiR-126 and other MicroRNAs in type 2 Diabetes Novelty and significance. *Circulation research* 107.6 (2010): 810-817.
4. Karolina, Dwi Setyowati, et al. Circulating miRNA profiles in patients with metabolic syndrome. *The Journal of Clinical Endocrinology & Metabolism* 97.12 (2012): E2271-E2276.
5. Goguet-Rubio, Perrine, et al. Existence of a strong correlation of biomarkers and miRNA in females with metabolic syndrome and obesity in a population of West Virginia. *International journal of medical sciences* 14.6 (2017): 543.
6. Lopez, YO Nunez, et al. Gastric bypass surgery with exercise alters plasma microRNAs that predict improvements in cardiometabolic risk. *International Journal of Obesity* 41.7 (2017): 1121.
7. Zhu, Z., et al. Role of microRNAs in the treatment of type 2 diabetes mellitus with Roux-en-Y gastric bypass. *Brazilian Journal of Medical and Biological Research* 50.3 (2017).
8. Villard, Audrey, et al. Diagnostic value of cell-free circulating microRNAs for obesity and type 2 diabetes: a meta-analysis. *Journal of molecular biomarkers & diagnosis* 6.6 (2015).
9. Willeit, Peter, et al. Circulating MicroRNA-122 is Associated With the Risk of New-Onset Metabolic Syndrome and Type-2-Diabetes. *Diabetes* (2016): db160731.
10. Heneghan, H. M., et al. Differential miRNA expression in omental adipose tissue and in the circulation of obese patients identifies novel metabolic biomarkers. *The Journal of Clinical Endocrinology & Metabolism* 96.5 (2011): E846-E850.
11. Karolina, Dwi Setyowati, et al. MicroRNA 144 impairs insulin signaling by inhibiting the expression of insulin receptor substrate 1 in type 2 diabetes mellitus. *PLoS one* 6.8 (2011): e22839.
12. Ma, Elizabeth, Yuchang Fu, and W. Timothy Garvey. Relationship of Circulating miRNAs with Insulin Sensitivity and Associated Metabolic Risk Factors in Humans. *Metabolic syndrome and related disorders* (2018).
13. Hubal, Monica J., et al. Circulating adipocyte derived exosomal MicroRNAs associated with decreased insulin resistance after gastric bypass. *Obesity* 25.1 (2017): 102-110.
14. Shen, Yanxin, et al. miR-34a and miR-125b are upregulated in peripheral blood mononuclear cells from patients with type 2 diabetes mellitus. *Experimental and therapeutic medicine* 14.6 (2017): 5589-5596.
15. Prats-Puig, Anna, et al. Changes in circulating microRNAs are associated with childhood obesity. *The Journal of Clinical Endocrinology & Metabolism* 98.10 (2013): E1655-E1660.
16. Ortega, Francisco José, et al. Targeting the circulating microRNA signature of obesity. *Clinical chemistry* 59.5 (2013): 781-792.
17. Ortega, Francisco J., et al. Profiling of circulating microRNAs reveals common microRNAs linked to type 2 diabetes that change with insulin sensitization. *Diabetes care* 37.5 (2014): 1375-1383.
18. Botzer, Alon, et al. A system view and analysis of essential hypertension. *Journal of hypertension* (2018).
19. Rottiers, Veerle, and Anders M. Nääär. MicroRNAs in metabolism and metabolic disorders. *Nature reviews Molecular cell biology* 13.4 (2012): 239.
20. Flowers, Elena, et al. Circulating microRNAs associated with glycemic impairment and progression in Asian Indians. *Biomarker Research* 3.1 (2015): 22.
21. Párrizas, Marcelina, and Anna Novials. Circulating microRNAs as biomarkers for metabolic disease. *Best practice & research Clinical endocrinology & metabolism* 30.5 (2016): 591-601.

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