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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. ^[21]



QUANTITATIVE

- Sensitive
- Absolute quantification



ROBUST

- ELISA platform
- No reverse transcription
- No amplification



FAST

- 2-hours assay



AFFORDABLE

- Low cost per sample
- No special equipment

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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