Non-coding RNAs as therapeutic targets and diagnostic markers for cardiovascular diseases

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Technology description

Contract

Current treatment options for heart failure are expensive and/or invasive with high risks of complications, indicating a need for improved treatments and diagnostic tools. Non-coding RNA, such as microRNA (miRNA), regulate important cellular functions by altering gene expression. As miRNA expression levels change during the progression of heart failure, they are an attractive therapeutic target and diagnostic tool for evaluating heart disease both during the onset and progress as well as during the response to therapeutic interventions such as pharmacologic and non-pharmacologic treatments. However, technological limitations have previously hampered the development of a reliable miRNA profile indicative of heart disease. This technology utilizes RNA deep-sequencing to identify a specific and comprehensive miRNA profile for patients with heart failure and other cardiovascular diseases. The miRNA profile provided by this technology offers a valuable framework to potentially develop miRNA-based therapeutics, diagnostics for cardiovascular diseases, and health analytics tools for evaluating the efficacy of existing treatments.

Non-coding RNAs for improving diagnosis and developing a non-invasive treatment for cardiovascular disease

This technology provides a circulating miRNA profile that characterizes heart failure as well as other cardiovascular diseases and their responses to therapies. Past attempts to generate miRNA profiles for cardiovascular diseases were predominantly obtained from microarrays, which are limited by their detectable range and sensitivity. This technology, however, uses RNA deep-sequencing to generate a more specific and comprehensive miRNA profile. As such, this technology may provide a new class of circulating biomarkers and therapeutic targets for cardiovascular diseases.

This technology's been demonstrated via LVAD model. Advanced heart failure at the time of LVAD placement caused a dramatic increase in disease-specific circulating miRNAs compared with healthy tissues, which returned to normal levels as early as 3 months following LVAD placement. The drastic changes in the circulating miRNA profile before and after LVAD placement demonstrate the sensitivity of miRNA levels to heart failure and surgical intervention.

Publications

Akat KM, Moore-McGriff D, Morozov P, Brown M, Gogakos T, Correa Da Rosa J, Mihailovic A, Sauer M, Ji R, Ramarathnam A, Totary-Jain H, Williams Z, Tuschl T, Schulze PC. “Comparative RNA-sequencing analysis of myocardial and circulating small RNAs in human heart failure and their utility as biomarkers” PNAS USA. 2014 July 29; 111(30): 11151–11156.

Application area

miRNA-based therapeutics for heart failure and other cardiac diseases
Myocardial miRNAs as biomarkers for diagnosing heart failure and other cardiovascular diseases
Indicator for measuring efficacy of therapeutic intervention
Assays for monitoring cardiovascular disease progression
miRNA profiling in biomedical research

Advantages

More specific and comprehensive diagnostic power than microarray-based miRNA profiles
Circulating biomarkers improves ease of sample collection
A miRNA-based therapeutic may potentially be developed into a non-invasive treatment option for patients with heart failure

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