

Sex-Specific Transcriptional Dynamics of MYH6 and MYH7 in Human Heart: Insights from Large-Scale Cohort Studies



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Introduction

In human left ventricle myocardium, two isoforms of the myosin heavy chain (MHC) genes, **MYH6 and MYH7**, are expressed, which are essential for the contractile function of cardiac muscle.¹ At the transcriptional level, MYH6 forms approximately 30-50% of the total myosin content in healthy left ventricles.²

In response to pathological stimuli, the relative transcript levels of both myosin isoforms are altered; **MYH6** transcript levels are significantly **downregulated**, whereas **MYH7** gene expression is **elevated**.³ These alterations illustrate the typical hypertrophic response that distinguishes healthy hearts from pathologic ones.

Results

Tab. 1: Distribution of gender based on age					
	Gender	Number of individuals	Average age		
	Female <50	22	$37,23 \pm 9,58$		
	Female >50	42	$57,98 \pm 4,08$		
	Male <50	36	42,5 ± 7,7		
	Male >50	60	58,62 ± 4,72		
	MYH6		MYH7		
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Although the expression of both myosin genes has been thoroughly studied between healthy and pathological groups under various physiological conditions, less is known about their expression pattern in healthy human hearts of different genders and age.² In this study, we reanalyzed the transcriptional status of both genes in a large cohort of normal, human hearts with respect to gender, age, and presence of hypertension as one of the main cardiovascular risk factors.

Methodology

GSE141910 RNASeq library









Conclusion

This study investigates the expression of MYH6 and MYH7 genes in relation to sex, age, and hypertension in left ventricles of healthy female and male. The findings indicate significant differences in MYH6 expression among females across all categories, as well as between males and females aged over 50 years.

Hypertension appears to influence the expression of both genes, with higher impact on female over 50 years of age with hypertension, who exhibit significantly decreased MYH6 gene expression in all between gender comparisons.



Fig. 2: Comparisons between groups based on age and gender. We used Mann - Whitney test with a significant level $p \le 0,05$.

Tab. 2: Comparison of relative expression of MYH6 and MYH7 genes between groups of different gender, age and physiological statusNumbers correspond to the results of the Mann-Whitney test. The arrows indicate the change in expression of the corresponding gene: \blacktriangle - up, ∇ - down.

Pairwise comparisons	MYH6 gene	MYH7 gene
female > 50, with hypertension vs. female > 50, no hypertension	0,187	0,780
male > 50, with hypertension vs. male > 50, no hypertension	0,336	0,505

These alterations in myosin gene expression are likely associated with sex hormone levels, particularly estrogen, in females across different age groups, including changes related to menopause. The results suggest that age, sex, and hypertension collectively impact MYH6 expression levels in female. Future studies should include a larger cohort along with comprehensive medical histories to validate and expand these findings.

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