

THE ROLE OF VITAMIN C IN REGULATING STAR GENE EXPRESSION AND GLUCOCORTICOID PRODUCTION IN ADRENAL GLAND CELL LINE

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ABSTRAK

KHARISYA TITY AZIZA. Peran Vitamin C dalam Mengatur Ekspresi Gen StAR dan Produksi Glukokortikoid pada Garis Sel Kelenjar Adrenal. Dibimbing oleh **SLAMET BUDIJANTO.**

Stres merupakan masalah utama dalam kehidupan modern, dengan semakin banyak orang mengalami kecemasan dan depresi, termasuk di Indonesia. Sebagai respons terhadap stres, kelenjar pituitari melepaskan hormon adrenokortikotropik (ACTH) yang menginstruksikan korteks adrenal untuk memulai proses steroidogenesis dan menghasilkan kortisol. Kadar kortisol yang berlebihan dapat menyebabkan berbagai masalah kesehatan, mulai dari depresi hingga penyakit Alzheimer. Hipotesis penelitian ini adalah vitamin C dapat menurunkan ekspresi gen StAR di korteks adrenal, sehingga produksi kortisol berkurang, karena transportasi kolesterol oleh StAR diperlukan dalam steroidogenesis. Untuk menguji hipotesis tersebut, dilakukan uji qPCR dan ELISA kortisol pada garis sel H295R dengan empat kelompok perlakuan: kontrol, vitamin C 10 mM, forskolin 20 mM, dan vitamin C plus forskolin. Hasil penelitian menunjukkan bahwa vitamin C menurunkan ekspresi gen StAR dan kadar kortisol pada kelompok yang mengandung forskolin. Temuan ini menyoroti potensi vitamin C dalam mengendalikan kadar kortisol terkait stres, serta pentingnya asupan vitamin C yang cukup dari buah dan sayuran untuk mencegah masalah kesehatan akibat kadar kortisol tinggi dan kekurangan vitamin C.

Kata kunci: ekspresi gen StAR, korteks adrenal, kortisol, stress, vitamin C

ABSTRACT

KHARISYA TITY AZIZA. The Role of Vitamin C in Regulating StAR Gene Expression and Glucocorticoid Production in Adrenal Gland Cell Line. Supervised by **SLAMET BUDIJANTO.**

Stress is a major concern in modern living, with an increasing number of people feeling anxiety and depression, including in Indonesia. In response to this stress, the pituitary gland releases adrenocorticotrophic hormone (ACTH), which instructs the adrenal cortex to initiate the process of steroidogenesis and create cortisol. Too much cortisol can lead to a range of health issues from depression to Alzheimer's disease. The hypothesis of this study is vitamin C may decrease StAR gene expression in the adrenal cortex, leading to decreased cortisol production, since cholesterol transport by StAR is required in steroidogenesis. To test the hypothesis, qPCR and cortisol ELISA tests were done on the H295R cell line with four treatment groups: control, 10 mM vitamin C, 20 mM forskolin, and vitamin C plus forskolin. The findings revealed that vitamin C lowered StAR gene expression cortisol levels in the forskolin-containing group. These findings highlight vitamin C's potential for controlling stress-related cortisol levels, as well as the need of getting enough vitamin C from fruits and vegetables to avoid health problems linked with high cortisol and vitamin C insufficiency.

Keywords: adrenal cortex, cortisol, StAR gene expression, stress, vitamin C



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THE ROLE OF VITAMIN C IN REGULATING STAR GENE EXPRESSION AND GLUCOCORTICOID PRODUCTION IN ADRENAL GLAND CELL LINE

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Undergraduate Thesis
Submitted as a requirement for obtaining
Bachelor's Degree in Food Technology

**DEPARTEMENT OF FOOD SCIENCE AND TECHNOLOGY
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PREFACE

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The author welcomes helpful critique and recommendations for additional development, acknowledging that this undergraduate thesis may still have weaknesses. It is intended that readers will find this research useful and that it will further scientific understanding.

Bogor, September 2025

Kharisya Tity Aziza

TABLE OF CONTENTS

LIST OF TABLES	xi
LIST OF FIGURES	xii
LIST OF APPENDIXES	xiii
I INTRODUCTION	1
1.1 Background	1
1.2 Problem Statement	2
1.3 Objective	3
1.4 Benefits	3
II LITERATURE REVIEW	4
2.1 Adrenal Glands	4
2.2 Glucocorticoids	4
2.3 Steroidogenic Acute Regulatory Protein (StAR Protein)	5
2.4 Vitamin C	6
2.5 Forskolin	6
2.6 qPCR for Gene Expression Analysis	7
2.7 Cortisol ELISA for Glucocorticoid Measurement	7
III METHODOLOGY	9
3.1 Time and Place	9
3.2 Equipment and Materials	9
3.3 Work Procedure	9
3.3.1 Cell Preparation	10
3.3.2 Addition of Diluted Forskolin and Vitamin C on H295R Cell	11
3.3.3 mRNA Isolation	11
3.3.4 cDNA Making	12
3.4 Analytical Methods	12
3.4.1 qPCR Analysis	12
3.4.2 Cortisol ELISA Analysis	15
3.5 Data analysis	15
IV RESULTS AND DISCUSSION	16
4.1 Changes in StAR Gene Expression and Cortisol Concentrations Before and After Vitamin C Addition	16
4.2 Vitamin C Modulates Cortisol Concentration by Regulating StAR Gene Expression in the Adrenal Gland	17
4.3 Minimum and Maximum Vitamin C Intake	18
4.4 The Way the Body Regulates Vitamin C	19
4.5 Excessive Vitamin C Intake and Excretion	19
4.6 Vitamin C Sources Beyond Supplement	20
V CONCLUSION AND RECOMMENDATION	23
5.1 Conclusion	23
5.2 Recommendation	23

BIBLIOGRAPHY	24
APPENDIX	32
BIOGRAPHY	34

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LIST OF TABLES

1	Table 1	Composition of each sample's cDNA	12
2	Table 2	5' to 3' sequence of each primer	13
3	Table 3	List of fruits and vegetable with high vitamin C content	20

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LIST OF FIGURES

4	Figure 1 Overview of the mechanisms of StAR protein activity in steroidogenesis and cholesterol transport after ACTH stimulation (Ahmed <i>et al.</i> 2019)	6
5	Figure 2 Research procedure flowchart	10
6	Figure 3 Treatment distribution for each well	11
7	Figure 4 The distribution of the contents in each microtube	13
8	Figure 5 Plate image design for qPCR test	14
9	Figure 6 The effect of vitamin C on StAR Gene Expression in H295R cell line. The bar chart represents the mean expression levels of StAR gene across four different sample groups. Same letter indicates no significant difference based on t-test at a 5% significance level, followed by Tukey's post hoc test.	16
10	Figure 7 The effect of vitamin C on cortisol concentration in H295R cell line. The bar chart represents the mean concentration of cortisol across four different sample groups. Same letter indicates no significant difference based on t-test at a 5% significance level, followed by Tukey's post hoc test.	17

LIST OF APPENDIXES

11	Appendix 1 Graphic of amplification plot from qPCR analysis that shows the real amplification of target genes (GAPDH and StAR).	32
12	Appendix 2 Graphic of melt curve plot from qPCR analysis that verifies the specificity of the amplified products.	32
13	Appendix 3 Tukey's post hoc test results following t-test on relative StAR gene expression data.	32
14	Appendix 4 Tukey's post hoc test results following t-test on cortisol concentration data.	33



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