

DOCTORAL THESIS

The vascular modulation effect of Panax ginseng

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The Vascular Modulation Effect of *Panax Ginseng*

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ABSTRACT

The famous herb, ginseng, bears the Latin name *Panax ginseng*, meaning “all healing”. With various pharmacological effects, it is being crowned as “king of herbs”. *Shengnong Bencao Jing* first documented the use of ginseng to repair the five viscera and also listed the ability of weight reduction and promotion of longevity. Though ginseng contains many complicated ingredients, one of the most active groups of compounds is called ginsenosides. Ginsenosides can be subdivided into three categories: protopanaxadiol (PPD)-type, protopanaxatriol (PPT)-type and oleanolic acid derivatives.

Despite the facts that ginseng has been used for thousands of years as therapeutic agent, its pharmacological and physiological effects are not clearly known. Our laboratory discovered that Rg₁, naturally found in largest amount as the PPT-type ginsenosides, it generates a series of signals to promote angiogenesis and affects a wide range of physiological activities including wound healing, fetal development and cell growth. Interestingly, Rb₁, a component of the PPD-type ginsenosides, suppresses the development of new blood vessels. These counteracting effects were interpreted as “*Yin/Yang*” effects within the context of Traditional Chinese medicine.

Panax ginseng was believed to have cardiovascular protective effects. We hypothesized that the protection may be due to the anti-obesity, anti-migration, anti-proliferation and anti-inflammation properties of *Panax ginseng*. In the current study, we used animal models, physiological models, aortic tissues and vascular cells to investigate the effectiveness of *Panax ginseng*. The results showed that *Panax ginseng* can restore diabetes-induced impaired vasorelaxation via NO-dependent or NO-independent pathways. Moreover, *Panax ginseng* can

reduce serum triglyceride but not cholesterol in the diabetic animal model. The animals fed with ginseng extracts show an increased amount of normal visceral adipose tissue. In cell culture, results showed that ginsenosides have different effects on vascular smooth muscle cell migration and proliferation. We also found that ginseng or ginsenosides may have anti-inflammatory effects, but limited to reducing inflammation at the gene level instead of improving the pathological conditions. Conversely, some of the ginsenosides may exert inflammation through exaggerated production of inducible form of nitric oxide synthase. These findings have provided us information on the medicinal effects of *Panax ginseng* and the potential application of *Panax ginseng* for therapeutic uses.

TABLE OF CONTENTS

| | |
|--|------|
| Declaration | i |
| Abstract | ii |
| Acknowledgements | iv |
| Table of Contents | vi |
| List of Tables | x |
| List of Figures | xi |
| List of Abbreviation | xiv |
| | |
| <u>CHAPTER 1: Background and Literature Review</u> | |
| 1.1 The physiology of the cardiovascular system..... | P.1 |
| 1.2 Cardiovascular disease (CVD) and risk factors | P.3 |
| 1.2.1 Atherosclerosis..... | P.4 |
| 1.2.1.1 Shear stress and plaque formation..... | P.5 |
| 1.2.1.2 Nitric oxide synthase..... | P.6 |
| 1.2.1.3 Vascular smooth muscle cells proliferation and migration..... | P.8 |
| 1.2.1.4 Atherosclerosis-related genes..... | P.9 |
| 1.2.2 Risk factors of CVD..... | P.11 |
| 1.2.2.1 Obesity and dyslipidemia..... | P.11 |
| 1.2.2.2 Diabetes mellitus..... | P.13 |
| 1.3 Traditional Chinese Medicine (TCM)..... | P.13 |
| 1.4 <i>Panax ginseng</i> | P.15 |
| 1.4.1 Classification of ginsenosides..... | P.16 |
| 1.4.2 Pharmacological effects and pharmacokinetics of <i>Panax ginseng</i> | P.18 |
| 1.4.3 Metabolic pathways of ginsenosides | P.19 |
| 1.5 Research methods to study the cardiovascular effects of <i>Panax ginseng</i> ... | P.23 |

| | |
|--|------|
| 1.5.1 Animal study for CVD..... | P.23 |
| 1.5.2 <i>In vitro</i> study for atherosclerosis..... | P.23 |
| 1.5.2.1 Vascular endothelial cells..... | P.24 |
| 1.5.2.2 Vascular smooth muscle cells (VSMCs) | P.24 |
| 1.6 Aim of the study..... | P.25 |

CHAPTER 2: Materials and Methods

| | |
|---|------|
| 2.1 Experimental animals ethics and welfare..... | P.26 |
| 2.1.1 Induction of diabetes in Sprague-Dawley rats..... | P.26 |
| 2.1.2 Ginseng preparation | P.27 |
| 2.1.3 Ginseng extracts administration and treatment of control and positive control groups..... | P.27 |
| 2.2 Tissue bath experiment-Preparation of isolated rat aortic rings..... | P.28 |
| 2.2.1 Measurement of contractile and relaxant responses in the rat aortic rings | P.29 |
| 2.2.2 Blood profile of the experimental rats..... | P.30 |
| 2.3 RT ² Profiler rat atherosclerosis PCR array analysis..... | P.30 |
| 2.4 <i>In vitro</i> studies | P.31 |
| 2.4.1 Culture of aortic rat vascular smooth muscle cells..... | P.31 |
| 2.4.2 Immunostaining for cultured vascular smooth muscle cells..... | P.32 |
| 2.4.3 Migration assay..... | P.33 |
| 2.4.4 Proliferation assay of VSMCs..... | P.36 |
| 2.4.5 Determination of nitrite levels in smooth muscle cell culture media..... | P.36 |
| 2.4.6 Measurement of protein contents..... | P.37 |
| 2.5 Statistical analysis..... | P.37 |

CHAPTER 3: Results

| | |
|---|------|
| 3.1 Ginseng preparation and HPLC fingerprint of ginseng extracts..... | P.38 |
| 3.2 Vascular smooth muscle cell culture..... | P.39 |
| 3.3 The vascular protective effects of <i>Panax ginseng</i> extracts..... | P.41 |
| 3.3.1 Ginseng extracts restore high glucose induced endothelial dysfunctions..... | P.42 |
| 3.3.2 Blood profile, body weight, and weights of the experimental rats... | P.46 |
| 3.3.3 Ginseng extracts suppress the expression of atherosclerosis-related genes..... | P.55 |
| 3.4 The “ <i>Yin/Yang</i> ” of ginsenosides..... | P.59 |
| 3.4.1 Ginsenosides affect vascular smooth muscle cell migration..... | P.59 |
| 3.4.2 Ginsenosides affect vascular smooth muscle cell proliferation..... | P.61 |
| 3.4.3 Ginsenoside PPT–induced NO-dependent vasorelaxation..... | P.64 |
| 3.4.4 Exaggerate production of inducible form of nitric oxide synthase (in terms of nitrite)..... | P.65 |

CHAPTER 4: Discussion

| | |
|--|------|
| 4.1 Ginseng restores glucose-induced endothelial dysfunctions and improves diabetic conditions..... | P.68 |
| 4.2 Ginseng affects lipid metabolism and alters expression of atherosclerosis-related genes..... | P.70 |
| 4.3 <i>In vitro</i> studies with ginsenosides..... | P.73 |
| 4.3.1 Ginsenoside Rg ₁ inhibits VSMCs migration while ginsenoside Rb ₁ promotes VSMCs migration..... | P.73 |
| 4.3.2 Ginsenoside Rh ₂ (S) inhibits VSMCs proliferation..... | P.74 |
| 4.3.3 Ginsenoside Rh ₂ (S) imposes additive effects on TNF- α -induced iNOS production..... | P.75 |
| 4.3.4 Ginsenoside PPT induced NO-dependent vasorelaxation..... | P.75 |

CHAPTER 5: Concluding Remarks

| | |
|---|--------------|
| 5.1 Summary of the studies..... | P.77 |
| 5.2 Clinical significance of <i>Panax ginseng</i> and its ginsenosides..... | P.81 |
| 5.3 Research potential of <i>Panax ginseng</i> | P.82 |
| 5.4 Safety cautions..... | P.82 |
| | |
| Appendices..... | P.84 |
| List of References..... | P.88 |
| List of Publications..... | P.103 |
| Curriculum Vitae..... | P.104 |