Table of Contents

Introduction on Functional Foods..... **Error! Bookmark not defined.**

Executive Summary ..... **Error! Bookmark not defined.**

Introduction..... **Error! Bookmark not defined.**

Functional Foods..... **Error! Bookmark not defined.**

Medical Foods ..... **Error! Bookmark not defined.**

Market ..... **Error! Bookmark not defined.**

Nutritional Genomics ..... **Error! Bookmark not defined.**

Regulatory ..... **Error! Bookmark not defined.**

Conditions and Diseases..... **Error! Bookmark not defined.**

Functional Ingredients: Phytochemical and Whole Food Ingredients**Error! Bookmark not defined.**

Functional Ingredient Delivery Technologies ..... **Error! Bookmark not defined.**

Technology Profiles..... **Error! Bookmark not defined.**

Chapter I: Functional Foods..... **Error! Bookmark not defined.**

History of Functional Food ..... **Error! Bookmark not defined.**

The Concept of Functional Foods ..... **Error! Bookmark not defined.**

History of FOSHU in Japan ..... **Error! Bookmark not defined.**

Functional Foods in the United States..... **Error! Bookmark not defined.**

Functional Foods in Europe..... **Error! Bookmark not defined.**

Conventional Food ..... **Error! Bookmark not defined.**

Modified Functional Foods ..... **Error! Bookmark not defined.**

Special Dietary Use..... **Error! Bookmark not defined.**

Medical Foods ..... **Error! Bookmark not defined.**

Conclusion..... **Error! Bookmark not defined.**

Chapter II: Medical Foods..... **Error! Bookmark not defined.**

Introduction..... **Error! Bookmark not defined.**

Metabolism and Metabolic Disorders ..... **Error! Bookmark not defined.**

Metabolic Disorders ..... **Error! Bookmark not defined.**

Categorizing Medical Foods..... **Error! Bookmark not defined.**

Medical Foods VS Synthetic Medications and Dietary Supplements**Error! Bookmark not defined.**

Table 1: Differences in disease treatment and prevention**Error! Bookmark not defined.**

Conclusion..... **Error! Bookmark not defined.**

Table 2: Differences between categories ..... **Error! Bookmark not defined.**

Chapter III: Nutritional Genomics..... **Error! Bookmark not defined.**

Introduction..... **Error! Bookmark not defined.**
Nutrigenomics and Nutrigenetics ..... **Error! Bookmark not defined.**
Diet, Disease, and Nutritional Genomics..... **Error! Bookmark not defined.**
Figure 1: Demonstration of the effects of nutrients on **Error! Bookmark not defined.**
protein development and genomic and metabolomics function **Error! Bookmark not defined.**
Nutritional Genomic Influence on Modified Functional Food and Medical Foods.. **Error! Bookmark not defined.**
Nutritional Genomics and Personalized Medicine..... **Error! Bookmark not defined.**
Conclusion..... **Error! Bookmark not defined.**
Chapter IV: Conditions and Diseases ..... **Error! Bookmark not defined.**
Introduction..... **Error! Bookmark not defined.**
Figure 2: Obesity can contribute to a heightened ..... **Error! Bookmark not defined.**
risk for the development of chronic illnesses ..... **Error! Bookmark not defined.**
Cardiovascular Disease ..... **Error! Bookmark not defined.**
Figure 3: Cross sections of both a normal artery (A) . **Error! Bookmark not defined.**
and an artery influenced by atherosclerosis (B) ..... **Error! Bookmark not defined.**
Effects of Phytosterols on Cardiovascular Disease ... **Error! Bookmark not defined.**
Figure 4: Mechanism of action of phytosterol absorption and excretion **Error! Bookmark not defined.**
Effects of Soluble Fiber on Cardiovascular Disease.. **Error! Bookmark not defined.**
Diabetes ..... **Error! Bookmark not defined.**
Type 1 Diabetes..... **Error! Bookmark not defined.**
Gestational Diabetes ..... **Error! Bookmark not defined.**
Type 2 Diabetes..... **Error! Bookmark not defined.**
Glycemic Control of Diabetes ..... **Error! Bookmark not defined.**
Monitoring Blood Lipid and Blood Pressure for Diabetics **Error! Bookmark not defined.**
Effects of Functional Foods on Diabetes ..... **Error! Bookmark not defined.**
Figure 5: Production of sucromalt..... **Error! Bookmark not defined.**
Figure 6: Structural differences between sucrose and isomaltulose **Error! Bookmark not defined.**
Alzheimer's Disease..... **Error! Bookmark not defined.**
Figure 7: Illustration of Alzheimer's effect on brain tissue **Error! Bookmark not defined.**
Treatments of AD..... **Error! Bookmark not defined.**
Effects of Functional Foods on Alzheimer's..... **Error! Bookmark not defined.**
Osteopenia and Osteoporosis..... **Error! Bookmark not defined.**
Dietary Management of Osteoporosis ..... **Error! Bookmark not defined.**
Vitamin D ..... **Error! Bookmark not defined.**

Vitamin K ..... **Error! Bookmark not defined.**
Phytoestrogens ..... **Error! Bookmark not defined.**
Cancer ..... **Error! Bookmark not defined.**
Food Allergies ..... **Error! Bookmark not defined.**
Inherited Metabolic Disorders ..... **Error! Bookmark not defined.**
Conclusion ..... **Error! Bookmark not defined.**
Chapter V: Phytochemicals and Their Potential Health Effects **Error! Bookmark not defined.**
Introduction ..... **Error! Bookmark not defined.**
Polyphenols ..... **Error! Bookmark not defined.**
Flavonoids ..... **Error! Bookmark not defined.**
Table 3: Flavonoids Summary ..... **Error! Bookmark not defined.**
Flavanoid ..... **Error! Bookmark not defined.**
Condition ..... **Error! Bookmark not defined.**
Scientific Evidence ..... **Error! Bookmark not defined.**
Anthocyanin ..... **Error! Bookmark not defined.**
Flavonol: Quercetin ..... **Error! Bookmark not defined.**
Flavones ..... **Error! Bookmark not defined.**
Catechins ..... **Error! Bookmark not defined.**
Flavanones ..... **Error! Bookmark not defined.**
Ellagic Acid ..... **Error! Bookmark not defined.**
Phytoestrogen ..... **Error! Bookmark not defined.**
Carotenoids ..... **Error! Bookmark not defined.**
Stilbenoid: Resveratrol ..... **Error! Bookmark not defined.**
Capsaicinoid ..... **Error! Bookmark not defined.**
Phytosterols ..... **Error! Bookmark not defined.**
Tocopherols and Tocotrienols ..... **Error! Bookmark not defined.**
Tannic Acids ..... **Error! Bookmark not defined.**
Organosulfur compounds ..... **Error! Bookmark not defined.**
Conclusion ..... **Error! Bookmark not defined.**
Chapter VI: Functional Whole Food Ingredients ..... **Error! Bookmark not defined.**
Introduction ..... **Error! Bookmark not defined.**
Superfruit ..... **Error! Bookmark not defined.**
Table 4: Superfruits Summary ..... **Error! Bookmark not defined.**
Superfruit ..... **Error! Bookmark not defined.**
Condition ..... **Error! Bookmark not defined.**
Scientific Evidence ..... **Error! Bookmark not defined.**

Acai berry ..... **Error! Bookmark not defined.**
Goji Berry ..... **Error! Bookmark not defined.**
Pomegranate ..... **Error! Bookmark not defined.**
Mangosteen ..... **Error! Bookmark not defined.**
Guarana ..... **Error! Bookmark not defined.**
Graviola ..... **Error! Bookmark not defined.**
Maqui Berry ..... **Error! Bookmark not defined.**
Superseeds ..... **Error! Bookmark not defined.**
Table 5: Superseeds Summary ..... **Error! Bookmark not defined.**
Chia Seeds ..... **Error! Bookmark not defined.**
Flax seeds ..... **Error! Bookmark not defined.**
Hemp Seed ..... **Error! Bookmark not defined.**
Cocoa ..... **Error! Bookmark not defined.**
Marine Bioactives ..... **Error! Bookmark not defined.**
Whole Grains ..... **Error! Bookmark not defined.**
Table 6: Whole Grains Summary ..... **Error! Bookmark not defined.**
Quinoa ..... **Error! Bookmark not defined.**
Buckwheat ..... **Error! Bookmark not defined.**
Legumes ..... **Error! Bookmark not defined.**
Lupins ..... **Error! Bookmark not defined.**
Herbs and Spices ..... **Error! Bookmark not defined.**
Table 7: Herbs and Spices Summary ..... **Error! Bookmark not defined.**
Cinnamon ..... **Error! Bookmark not defined.**
Ginger ..... **Error! Bookmark not defined.**
Rosemary ..... **Error! Bookmark not defined.**
Ginseng ..... **Error! Bookmark not defined.**
Essential Fatty Acids ..... **Error! Bookmark not defined.**
Omega-3 Fatty Acids ..... **Error! Bookmark not defined.**
Omega-6 Fatty Acids ..... **Error! Bookmark not defined.**
Conclusion ..... **Error! Bookmark not defined.**
Chapter VII: Functional Ingredient ..... **Error! Bookmark not defined.**
Delivery Technologies ..... **Error! Bookmark not defined.**
Introduction ..... **Error! Bookmark not defined.**
Delivery Formats for Functional Ingredients ..... **Error! Bookmark not defined.**
Delivery Technology Studies ..... **Error! Bookmark not defined.**
Company Profiles with Delivery Technologies ..... **Error! Bookmark not defined.**

Delivery Technologies for the Medical Food Market ..... **Error! Bookmark not defined.**
Comparison among the Use of Delivery Technologies for Functional Food Markets **Error! Bookmark not defined.**
Conclusion..... **Error! Bookmark not defined.**
Chapter XIII: Regulations..... **Error! Bookmark not defined.**
Introduction..... **Error! Bookmark not defined.**
International Regulations..... **Error! Bookmark not defined.**
US Food Regulations ..... **Error! Bookmark not defined.**
Table 8: Allowed Nutritional Ingredient Additives ..... **Error! Bookmark not defined.**
Health Claims ..... **Error! Bookmark not defined.**
Table 9: NLEA Approved Health Claims..... **Error! Bookmark not defined.**
Table 10: Health Claims Based on Authoritative Statements **Error! Bookmark not defined.**
Table 11: Standardized Qualifying Language for Qualified Health Claims **Error! Bookmark not defined.**
Nutrient Content Claims..... **Error! Bookmark not defined.**
Table 12: Nutrient Content Claims and Requirements **Error! Bookmark not defined.**
Structure/Function Claim ..... **Error! Bookmark not defined.**
Medical Foods ..... **Error! Bookmark not defined.**
Special Dietary Use Foods ..... **Error! Bookmark not defined.**
European Union Regulations ..... **Error! Bookmark not defined.**
Table 14: Nutrition Claims and Conditions Applying to Them **Error! Bookmark not defined.**
Japanese Regulations..... **Error! Bookmark not defined.**
Table 15: Approved FOSHU Products..... **Error! Bookmark not defined.**
Table 16: Standards and Specifications ..... **Error! Bookmark not defined.**
China Regulations..... **Error! Bookmark not defined.**
Table 17: Functional Claim and Scientific Evidence Requirements **Error! Bookmark not defined.**
Figure 11: Approval Flow Chart for Health Foods in China **Error! Bookmark not defined.**
Korea Regulations..... **Error! Bookmark not defined.**
Table 18: Functional Ingredients and Prerequisites for Claims **Error! Bookmark not defined.**
Figure 12: Decision Tree for Safety Evaluation of Functional Ingredient for Health Functional Food ..... **Error! Bookmark not defined.**
Table 19: Scope of Submitted Documents Based on Safety Tree **Error! Bookmark not defined.**
Figure 13: Health Functional Food Symbol for Labeling in Korea **Error! Bookmark not defined.**
Conclusion..... **Error! Bookmark not defined.**

Chapter IX: Market ..... **Error! Bookmark not defined.**
Introduction ..... **Error! Bookmark not defined.**
Modified Functional Food Market ..... **Error! Bookmark not defined.**
Figure 14: Modified Functional Foods Global Market 2010-2015 **Error! Bookmark not defined.**
Modified Functional Food Trends ..... **Error! Bookmark not defined.**
Figure 15: Global Overweight and Obesity Rates of Adult Population **Error! Bookmark not defined.**
Medical Food Market ..... **Error! Bookmark not defined.**
Table 20: Medical Foods Global Projected Market up to 2015 **Error! Bookmark not defined.**
Medical Food Market Trends ..... **Error! Bookmark not defined.**
Current Business Opportunities ..... **Error! Bookmark not defined.**
Medical Food and Market Issues ..... **Error! Bookmark not defined.**
Key Trends for Market Success ..... **Error! Bookmark not defined.**
Conclusion ..... **Error! Bookmark not defined.**
Chapter X: Conclusion ..... **Error! Bookmark not defined.**
Chapter XI: Technology Profiles ..... **Error! Bookmark not defined.**
Work Cited ..... **Error! Bookmark not defined.**