CHOLESTEROL-LOWERING AND ANTI-ATHEROGENIC PROPERTIES OF EDIBLE BIRD'S NEST *IN VITRO* AND *IN VIVO*

By

NURUL NADIAH BINTI MOHAMAD NASIR

Thesis Submitted to the School of Graduate Studies, Universiti Putra Malaysia, in Fulfilment of the Requirements for the Degree of Doctor of Philosophy

September 2022

DEDICATION

In loving memories, Allahyarhamah Prof Dr Maznah binti Ismail. Al-Fatihah.

This dissertation is dedicated to:

My husband,
Wan Nazirul Mubin
For your love, support, and constant patience. From you, I have learned a great deal about sacrifice, discipline, and compromise.

My beloved parents,
Mohamad Nasir & Fatimah
Wan Azmi & Azidah
For always being there to support, encourage, and believe in me.

My children,
Wan Zara Sofea & Wan Atif Zikry
For always cheering me up and both of you are the reason for me to keep going chasing my dreams.

My family members,
Siti Fairuz, Muhammad Faris, Nur Amirah, Aimi Liyana, Wan Azleen Normaya, Wan Azleen Norliana, Wan Noruddin Rasol, Nur Hanisah, Wan Nasrul Fikree, Muhd Aqil, Hana Humaira, Wan Tasneem, Wan Idris
"Everyone needs a house to live in, but a supportive family is what builds a home" – *Anthony Liccione*

My best friend and research partner,
Ramlah
For all the good times we had together from the beginning till the end of the research project.

My respected supervisors,
Prof Dr Md Zuki, Prof Datin Dr Rozi, Dr. Nor Asma
Thank you for the encouragement and opportunity given to me to pursue my doctoral degree. A great mentor team that keeps me motivated and strives for success.

Abstract of thesis presented to the Senate of Universiti Putra Malaysia in fulfilment of the requirement for the degree of Doctor of Philosophy

CHOLESTEROL-LOWERING AND ANTI-ATHEROGENIC PROPERTIES OF EDIBLE BIRD'S NEST *IN VITRO* AND *IN VIVO*

By

NURUL NADIAH BINTI MOHAMAD NASIR

September 2022

Chairman : Professor Md. Zuki bin Abu Bakar @ Zakaria, PhD
Institute : Bioscience

Edible bird's nest (EBN) is a highly nutritious food product with proven cardioprotective effects. However, the fundamental mechanisms involved in preventing atherogenesis remain unknown, particularly those related to cholesterol metabolism and atherosclerotic plaque formation. The present study concentrates on the cholesterol-lowering and anti-atherogenic properties of EBN, using both *in vitro* and *in vivo* models. Two different shapes of EBNs were used in this study, namely half-cup (HC) and stripe-shaped (ST). Major nutrients in EBNs are protein (54-57%), carbohydrates (22-24%), crude fibre (3-20%), calcium (650-740 mg/100g), sodium (500-680 mg/100g), and magnesium (100-130 mg/100g). Both essential and non-essential amino acids were also identified in the EBNs from this study. Full stew (FS) and stew extract (SE) from HC of EBN were selected for the next analyses as it showed high extraction yield (FS: 92.29 ± 2.45%; SE: 12.50 ± 0.89%) and soluble protein concentration (FS: 375.6 ± 0.98 µg/mL; SE: 435.6 ± 2.63 µg/mL) as compared to the ST of EBN ($p < 0.05$). HPLC analysis showed that bioactive sialic acid was detected in both FS (7.91%) and SE (8.47%) of HC EBN, and was confirmed by SDS-PAGE. In this study, a novel protein marker, namely 78-kDa glucose-regulated protein was discovered in FS and SE of HC EBN by using LC-MS/MS. Digested HC EBN (FSh: FS hydrolysate; SEh: SE hydrolysate) possesses high activity as an antioxidant, anti-inflammatory, and inhibitor of HMGCR as compared to unhydrolyzed HC EBN. *In vitro* results demonstrated the potency of FSh and SEh in reducing inflammatory mediator secretion (NO: 42-60%; IL-6: 56-63%; IL-1β: 34-60%), monocyte migration (24-33%), and macrophage-cholesterol accumulation (40.4-42.9%) with more than 80% of cell viability in RAW 264.7 macrophages and THP-1 monocytes. Further *in vivo* investigation highlighted that dietary intervention with FS or SE of HC EBN at 500 mg/kg b.w/day for 12 weeks significantly improved serum lipid profiles (*i.e.,* reduced TC: 6.8-11.5%, LDL-c: 9.1-20.6%, TG: 42.4-44.2%, and increased HDL-c: 39.5%), atherogenic indices (*i.e.,* reduced CRI-I: 21.2-22.8%, CRI-II: 22.8-35.5%, AI: 19.4-33.4%), hepatosteatosis, stabilization of atherosclerotic plaque (*i.e.,* reduced I/M ratio: 27.3-43.6%), coagulation status (*i.e*., increased PT: 30-34%, APTT: 16-19%, and reduced Fb: 40-60%), liver function (*i.e*., reduced serum ALT: 28-30%, GGT: 26-29%), systemic oxidant-antioxidant balance (*i.e*., increased serum TAC: 39-48%, SOD: 135-295%, CAT: 27-29%, and reduced serum oxLDL: 20-34%), and inflammatory response (*i.e*., reduced serum P-selectin: 18-23%, MCP-1: 54-66%, IL-6: 40-47%, IL-1β: 32-49%) in the hypercholesterolemic rabbits ($p < 0.05$). EBNs supplementation also lowered the levels of hepatic HMGCR (1.3-1.4 fold), hepatic TC (1.6-1.7 fold) and aortic TC (1.9-2.2 fold) ($p < 0.05$). The modulatory effects of EBN on key genes related to cholesterol metabolism in the liver and aorta tissues showed consistent transcript regulation of PPARγ, LXRα, ABCA1, and LCAT. Gene expression analysis also suggested the potential involvement of the NOS3/NF-κB pathway in alleviating vascular oxidative stress and inflammation in hypercholesterolemic rabbits. This study provides scientific evidence and proves that consumption of EBN lowers cholesterol levels and could prevent atherogenesis. Therefore, it has a high potential therapeutic target in the prevention of atherosclerosis.

Abstrak tesis yang dikemukakan kepada Senat Universiti Putra Malaysia sebagai memenuhi keperluan untuk ijazah Doktor Falsafah

CIRI-CIRI PENURUNAN KOLESTEROL DAN ANTI-ATHEROGENIK SARANG BURUNG WALET *IN VITRO* DAN *IN VIVO*

Oleh

NURUL NADIAH BINTI MOHAMAD NASIR

September 2022

Pengerusi : Profesor Md. Zuki bin Abu Bakar @ Zakaria, PhD
Institut : Biosains

Sarang burung walet (EBN) ialah produk makanan yang berkhasiat serta dilaporkan mempunyai kesan kardioprotektif. Walaubagaimanapun, mekanisma asas yang terlibat dalam mencegah aterogenesis masih tidak diketahui, terutamanya yang berkaitan dengan metabolisma kolesterol dan pembentukan plak aterosklerotik. Kajian ini menumpukan kepada ciri-ciri penurunan kolesterol dan anti-atherogenik EBN, menggunakan model *in vitro* dan *in vivo*. Dua bentuk EBN yang berbeza digunakan dalam kajian ini iaitu berbentuk separa cawan (HC) dan berbentuk jalur (ST). Kandungan nutrien utama di dalam kedua-dua bentuk EBN adalah protein (54-57%), karbohidrat (22-24%), serat (3-20%), kalsium (650-740 mg/100g), natrium (500-680 mg/100g), dan magnesium (100-130 mg/100g). Profil asid amino mendapati EBN daripada kajian ini mengandungi kedua-dua asid amino perlu dan tidak perlu. "Full stew" (FS) dan "Stew extract" (SE) daripada EBN HC dipilih untuk analisa selanjutnya kerana ia menunjukkan hasil pengekstrakan (FS: 92.29 ± 2.45%; SE: 12.50 ± 0.89%) dan kandungan protein larut (FS: 375.6 ± 0.98 µg/mL; SE: 435.6 ± 2.63 µg/mL) yang tinggi berbanding dengan EBN ST (p < 0.05). Analisa HPLC menunjukkan bahawa bioaktif asid sialik dikesan dalam FS (7.91%) dan SE (8.47%) daripada EBN HC, serta disahkan melalui kaedah SDS-PAGE. Dalam kajian ini, protein "marker" novel iaitu protein 78-kDa kawalan-glukosa juga telah dikesan dalam FS dan SE daripada EBN HC melalui kaedah LC-MS/MS. EBN HC tercerna (FSh: FS hidrolisat; SEh: SE hidrolisat) mempunyai aktiviti antioksidan, anti-radang dan perencatan HMGCR yang tinggi berbanding EBN HC yang tidak terhidrolisis. Hasil kajian *in vitro* mendapati FSh dan SEh berpotensi mengurangkan penghasilan pengantara radang (NO: 42-60%; IL-6: 56-63%; IL-1β: 34-60%), migrasi monosit (24-33%), dan pengumpulan kolesterol di dalam makrofaj (40.4-42.9%), dengan lebih daripada 80% sel hidup mampu dikekalkan dalam sel-sel makrofaj RAW 264.7 dan monosit THP-1. Kajian *in vivo* selanjutnya memperlihatkan bahawa intervensi pemakanan dengan FS atau SE daripada EBN HC pada tahap 500 mg/kg b.b/hari selama 12 minggu secara signifikan telah menambahbaik profil serum lipid (iaitu, menurunkan TC: 6.8-11.5%, LDL-c: 9.1-20.6%, TG: 42.4-44.2%, dan meningkatkan HDL-c: 39.5%), indeks aterogenik (iaitu mengurangkan CRI-I: 21.2-22.8%, CRI-II: 22.8-35.5%, AI: 19.4-33.4%), hepatosteatosis, penstabilan plak aterosklerotik (iaitu, mengurangkan nisbah I/M: 27.3-43.6%), status pembekuan darah (iaitu, meningkatkan PT: 30-34%, APTT: 16-19%, dan menurunkan Fb: 40-60%), fungsi hati (iaitu, merendahkan serum ALT: 28-30%, GGT: 26-29%), keseimbangan oksidan-antioksidan (iaitu, meningkatkan serum TAC: 39-48%, SOD: 135-295%, CAT: 27-29%, dan menurunkan serum oxLDL: 20-34%), dan tindak balas keradangan (iaitu, mengurangkan serum P-selectin: 18-23%, MCP-1: 54-66%, IL-6: 40-47%, IL-1β: 32-49%) dalam arnab yang mempunyai hiperkolesterolemia ($p < 0.05$). Pemberian EBN juga menurunkan kandungan HMGCR hepatik (1.3-1.4 kali ganda), serta kolesterol di dalam hati (1.6-1.7 kali ganda) dan aorta (1.9-2.2 kali ganda) arnab tersebut ($p < 0.05$). Kesan modulasi EBN ke atas gen berkaitan metabolisma kolesterol dalam tisu hati dan aorta menunjukkan aturan transkrip yang konsisten pada gen PPARγ, LXRα, ABCA1, dan LCAT. Analisa ekspresi gen juga mencadangkan potensi pengaktifan hubungan gen NOS3/NF-κB dalam mengurangkan tekanan oksidatif vaskular dan keradangan dalam arnab yang mempunyai hiperkolesterolemia. Kajian ini memberikan bukti saintifik bahawa pengambilan EBN dapat merendahkan paras kolesterol dan boleh mencegah aterogenesis. Justeru, ia mempunyai sasaran terapeutik yang berpotensi tinggi dalam pencegahan aterosklerosis.

ACKNOWLEDGEMENTS

Praise be to Allah, The Most Merciful, The Most Compassionate, for granting me the opportunity and strength to complete this doctoral program.

I would like to extend my profound sense of gratitude and respect to my esteemed supervisor, Prof. Dr. Md Zuki bin Abu Bakar @ Zakaria, for his sustained commitment, immense knowledge, guidance, motivation, patience, and encouragement throughout my research journey. I am also greatly indebted to my co-supervisors, Prof Datin Dr. Rozi binti Mahmud, and Dr. Nor Asma binti Ab Razak for their sincere guidance, enthusiasm, strong motivation, and intellectual input which enabled me to complete this dissertation work. I could not have imagined having a better advisory team and mentors for my PhD study.

I would like to express my sincere thanks to all staff in the Natural Medicines and Products Research Laboratory (NaturMeds) in the Institute of Bioscience, Universiti Putra Malaysia (IBS, UPM), especially Assoc. Prof. Dr. Ahmad Faizal, Dr. Norsharina, Dr. Chan Kim Wei, Mdm. Zufliha, and Ms. Norhayati for assisting me with the technical aspects in the laboratory. Special thanks to Mdm. Mastura and Mr. Ahmad Termizi for their excellent administrative support for postgraduate students.

Many thanks to all the staff in the Faculty of Veterinary Medicine, UPM especially Dr Abu Bakar Danmaigoro, Dr Mostafa, and Mr. Mohd Jamil for the knowledge sharing and assistance especially during the animal study. Not forgetting to all research scholars, Dr Ooi Der Jiun, Dr Abu Bakar, Dr Ja'afaru, Dr Ramlah, Dr Fiza, Dr Ammar, Abdul Qayyum, Mohd. Adha, Arnisah, Hafiz, Salwana, and others for their moral support and valuable suggestion during my candidature.

I owe a debt of gratitude and respect to my beloved parents, my husband, my children, and other family members, who provided me with distinct character inspiration, consistent support, motivation, and encouragement at every moment of my study. Thank you for all your unconditional love and understanding.

To my late mentor, Allahyarhamah Prof. Dr Maznah binti Ismail who is always in my prayer, thank you for teaching me the importance of education and discipline.

To those who indirectly contributed to this research, your kindness means a lot to me. My utmost appreciation to all these people mentioned above. They have made this PhD journey an interesting, stimulating, and worthwhile learning experience. Thank you very much.

This thesis was submitted to the Senate of Universiti Putra Malaysia and has been accepted as fulfilment of the requirement for the degree of Doctor of Philosophy. The members of the Supervisory Committee were as follows:

Md. Zuki bin Abu Bakar @ Zakaria, PhD
Professor
Faculty of Veterinary Medicine
Universiti Putra Malaysia
(Chairman)

Rozi binti Mahmud, MBBS, MMed
Professor (Medical)
Faculty of Medicine and Health Sciences
Universiti Putra Malaysia
(Member)

Nor Asma binti Ab Razak, PhD
Research Officer
Institute of Bioscience
Universiti Putra Malaysia
(Member)

____
ZALILAH MOHD SHARIFF, PhD
Professor and Dean
School of Graduate Studies
Universiti Putra Malaysia

Date: 10 November 2022

Declaration by graduate student

I hereby confirm that:

- this thesis is my original work;
- quotations, illustrations and citations have been duly referenced;
- this thesis has not been submitted previously or concurrently for any other degree at any other institutions;
- intellectual property from the thesis and copyright of thesis are fully-owned by Universiti Putra Malaysia, as according to the Universiti Putra Malaysia (Research) Rules 2012;
- written permission must be obtained from supervisor and the office of Deputy Vice-Chancellor (Research and Innovation) before thesis is published (in the form of written, printed or in electronic form) including books, journals, modules, proceedings, popular writings, seminar papers, manuscripts, posters, reports, lecture notes, learning modules or any other materials as stated in the Universiti Putra Malaysia (Research) Rules 2012;
- there is no plagiarism or data falsification/fabrication in the thesis, and scholarly integrity is upheld as according to the Universiti Putra Malaysia (Graduate Studies) Rules 2003 (Revision 2012-2013) and the Universiti Putra Malaysia (Research) Rules 2012. The thesis has undergone plagiarism detection software.

Signature: ________________________ Date: __________________

Name and Matric No.: Nurul Nadiah binti Mohamad Nasir

Declaration by Members of Supervisory Committee

This is to confirm that:

- the research conducted and the writing of this thesis was under our supervision;
- supervision responsibilities as stated in the Universiti Putra Malaysia (Graduate Studies) Rules 2003 (Revision 2012-2013) are adhered to.

Signature: ______________________
Name of Chairman of Supervisory Committee: Professor Dr. Md. Zuki bin Abu Bakar @ Zakaria

Signature: ______________________
Name of Member of Supervisory Committee: Professor Datin Dr. Rozi binti Mahmud

Signature: ______________________
Name of Member of Supervisory Committee: Dr. Nor Asma binti Ab. Razak

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF ABBREVIATIONS

AAPH	2,2’-azobis (2-amidinopropane) dihydrochloride
ABCA1	ATP binding cassette subfamily A member 1
ABTS	2,2’-azino-bis (3-ethylbenzthiazoline-6-sulphonic acid
APTT	Activated partial thromboplastin time
Apo	Apolipoprotein
CAT	Catalase
CD36	Cluster of differentiation 36
CETP	Cholesteryl ester transfer protein
CRP	C-reactive protein
CYP7A1	Cytochrome P450 family 7 subfamily A member 1
DPPH	1,1-diphenyl-2-picrylhydrazyl
EBN	Edible bird’s nest
eNOS	Endothelial nitric oxide synthase
Fb	Fibrinogen
FS	Full stew of EBN
FSh	Full stew hydrolysate of EBN
GPX	Gluthathione peroxidase
GPX1	Gluthathione peroxidase 1
GSR	Gluthathione-disulfide reductase
IC_{50}	Half-maximal inhibitory concentration
IDL	Intermediate density lipoprotein
IL-1β	Interleukin-1 beta
IL-6	Interleukin-6
HCl	Hydrochloric acid

HDL	High-density lipoprotein
HDL-c	High-density lipoprotein cholesterol
HFC	High-fat high-cholesterol
HMG-CoA	3-hydroxy-3methylglutaryl-CoA
HMGCR	HMG-CoA reductase
HOMA-IR	Homeostatic model assessment for insulin resistance
HYL	Hyaluronidase
H_2O_2	Hydrogen peroxide
LCAT	Lecithin-cholesterol acyltransferase
LD_{50}	Median lethal dose
LOX	Lipoxygenase
LOX-1	Lectin-type oxidized low-density lipoprotein receptor 1
LXR	Liver X receptor
LXRα	Liver X receptor alpha
LDL	Low-density lipoprotein
LDL-c	Low-density lipoprotein cholesterol
LDLR	Low-density lipoprotein receptor
LPS	Lipopolysaccharides
MCP-1	Monocyte chemoattractant protein-1
MMP-2	Matrix metalloproteinase-2
NAFLD	Non-alcoholic fatty liver disease
NaOH	Sodium hydroxide
NF-κB	Nuclear factor-kappa B
NFκB1	Nuclear factor kappa B subunit 1
NO	Nitric oxide
NOS3	Nitric oxide synthase 3

$O_2^{\bullet -}$	Superoxide anion radical
OGTT	Oral glucose tolerance test
ORAC	Oxygen radical absorbance capacity
oxLDL	Oxidized low-density lipoprotein
PPARγ	Peroxisome proliferator-activated receptor gamma
PARP1	Poly (ADP-ribose) polymerase 1
PT	Prothrombin time
RCT	Reverse cholesterol transport
SE	Stew extract of EBN
SEh	Stew hydrolysate of EBN
SELP	P-selectin
SIRT1	Sirtuin 1
SOD	Superoxide dismutase
SOD1	Superoxide dismutase 1
SOD2	Superoxide dismutase 2
SOD3	Superoxide dismutase 3
SREBP2	Sterol regulatory element-binding protein 2
TEAC	Trolox equivalent antioxidant capacity
TC	Total cholesterol
TG	Triglycerides
TNF-α	Tumour necrosis factor-alpha
Trolox	6-hydroxy-2,5,7,8-tetramethylchroman-2-carboxylic acid
VCAM-1	Vascular cell adhesion molecule-1
VLDL	Very low-density lipoprotein
WHO	World Health Organization
XO	Xanthine oxidase

CHAPTER 1

INTRODUCTION

1.1 Introduction

Cardiovascular disease (CVD) continues to be the leading cause of death worldwide in both developed and developing countries, accounting for 32% of global mortality in 2019 (WHO, 2021). The number of deaths is expected to increase to about 23 million by 2030 (Virani et al., 2020). More than 80% of deaths from cardiovascular disease (CVD) occur in low- and middle-income countries (LMICs) (Bovet & Paccaud, 2011). As the population ages and unhealthy lifestyles become more common in LMICs, the burden of CVD is predicted to rise significantly. According to the Ministry of Health Malaysia's 2019 Health Facts, CVD mortality was the leading cause of death in government hospitals (21.65%) and the second leading cause of death in private hospitals (23.79%) (MOH, 2019).

Hypercholesterolemia is a significant modifiable risk factor for CVD, and it has been demonstrated that therapies (*i.e.*, pharmacological, nutrition, exercise, and smoking cessation) to reduce plasma cholesterol could reduce cardiovascular risk (Burkhardt, 2015). High plasma cholesterol levels are described as hypercholesterolemia, which is associated with an elevation in low-density lipoprotein (LDL). Hypercholesterolemia can be defined by plasma levels of total and LDL cholesterol (LDL-c) that are higher than the 95th percentile corrected for gender and age in each population (Martinez-Hervas & Ascaso, 2019). Clinicians usually prescribe statins, a 3-hydroxy-3-methylglutaryl–coenzyme A (HMG-CoA) reductase inhibitor to lower the cholesterol level in the patient with hypercholesterolemia.

In hypercholesterolemia, statins work by lowering LDL-c levels by 20% to 50%, reducing triglyceride levels by 10% to 20%, as well as elevating 5% to 10% high-density lipoprotein cholesterol (HDL-c) serum levels (Ramkumar et al., 2016; Odden et al., 2015; Taylor et al., 2013; Huang et al., 2013). Atherogenesis has been reported to be significantly impacted by statins by preventing vascular endothelial dysfunction, intrahepatic vasoconstriction, and inflammation (Kaplan et al., 2019; Trebicka & Schierwagen, 2015; Hognestad et al., 2004). However, a number of adverse effects have been documented in certain individuals, which may impair long-term medication compliance. Most of these side effects are caused by muscle problems and changes in the way the liver works (Chien et al., 2019). Thus, it is important to discover an alternate solution that has cholesterol-lowering properties with fewer adverse effects in alleviating atherosclerosis.

Natural dietary components found in foods that are taken orally and are considered to offer a therapeutic or health advantage are known as nutraceuticals (Souyoul et al., 2018). Curcumin, ginsenosides, red-yeast rice, omega-3 PUFAs, and allicin are examples of active ingredients in natural resources that could help to reduce LDL-c serum levels and prevent atherosclerosis (Momtazi-Borojeni et al., 2019; Moss & Ramji, 2016; Ruscica et al., 2014; Chan et al., 2013a). Edible bird's nest (EBN) is constructed from swiftlet's saliva, mostly from the species of *Aerodramus fuciphagus* (white nest) and *Aerodramus maximus* (black nest), and commonly consumed in a form of soup as traditional delicacy by Chinese community (Chok et al., 2021; Quek et al., 2018). Malaysia is located right at the centre of the swiftlet's habitat and is one of the largest producers in the EBN industry, which contributes about RM (Ringgit Malaysia) 5.2 billion of National Gross Income in 2020 (Daud et al., 2019a; Babji et al., 2015; Rabu & Nazmi, 2015).

Previous studies have shown that EBN has anti-aging, anti-inflammatory, anti-viral, immunomodulatory, antioxidant, and other therapeutic properties (Chua et al., 2021; Hwang et al., 2020; Haghani et al., 2016; Yew et al., 2014; Vimala et al., 2012; Guo et al., 2006). Malaysia exports 600 tonnes of EBN every year (Panyaarvudh, 2018). Each year, China is the largest importer of EBN. Between January and June 2021, China imported roughly 42.3 tonnes of ready-to-drink and processed EBN from Malaysia (Chok et al., 2021). To comprehend the biological activity of EBN as a medication or functional food, it is necessary to study its components. The nutritional analysis showed that EBN consists of high protein (42.0-63.0%), carbohydrate (22.6-27.3%), moisture (7.5-24.3%), ash (2.1-7.4%) and fat (0.14-1.28%) (Lee et al., 2021; Babji et al., 2018; Ma & Liu, 2012). Besides, EBN also contains minerals such as calcium, magnesium, sodium, potassium, iron, and phosphorus (Halimi et al., 2014; Marcone, 2005). The nutritional analysis also shown that EBN rich in amino acids (AAs) constituents with 17% of total essential AAs, which was significantly higher than other protein-rich foods, for instance, egg (4.7 - 7.0%) and milk (1.1%) (Quek et al., 2018). Amino acids are important for human biological functions such as development, metabolism, and immunity and essential AAs are required from the diet as they cannot be synthesised by the human body (He, 2011; Blachier et al., 2013).

Apart from the nutritional composition aforementioned, EBN has been documented to contain sialic acid (5.86-13.6%) which is a major bioactive glycoprotein detected in EBN (Dai et al., 2020; Ling et al., 2020; Quek et al., 2018). Numerous research has shown that sialic acid has a variety of health benefits including promoting neuronal development, preventing hypertension, enhancing the immune response of cancer cells as well as skin whitening (Ling et al., 2022; Khalid et al., 2019; Wang et al., 2018a; Zhou et al., 2019; Wong et al., 2018). Furthermore, the antioxidant and anti-inflammatory of sialic acid play a significant role in ameliorating cardiovascular health by lowering lipid profile and coagulation factors, as well as improving insulin sensitivity (Yida et al., 2015a; Yida et al., 2015b). Hence, sialic acid can be considered a valuable component in EBN with cholesterol-lowering and anti-atherogenic effects.

Despite the effectiveness of EBN in ameliorating cardiovascular events, the underlying mechanisms involved in inhibiting atherogenesis are not fully elucidated, especially on the cholesterol metabolism-related to atherosclerotic plaque formation. Thus, this study aimed to explore the cholesterol-lowering and anti-atherogenic effects of EBN by investigating its roles in cholesterol metabolism and atherosclerotic plaque formation. The effects of EBN on oxidative stress and inflammation related to atherosclerosis were also studied to evaluate its possible antioxidative and anti-inflammatory properties.

1.2 Hypotheses

i. The physicochemical characteristics and nutritional composition are varied between the different shapes of edible bird's nest (EBN).
ii. EBN has the ability to inhibit cholesterol synthesis with good antioxidant and anti-inflammatory activities, as well as inhibit early atherogenesis in mouse macrophage (RAW 264.7) and human monocytic (THP-1) cell lines.
iii. EBN possess anti-atherogenic effects via regulation of biomarkers and genes related to cholesterol metabolism in hypercholesterolemic-induced rabbit model.
iv. EBN attenuates vascular oxidative stress and inflammation via regulation of biomarkers and genes related to antioxidant and inflammation.

1.3 Objectives

General objective

To determine cholesterol-lowering and anti-atherogenic effects of edible bird's nest in vitro and in vivo

Specific objectives

i. To determine physicochemical characteristics, nutritional composition, and protein profiling of edible bird's nest (EBN).
ii. To determine the cholesterol synthesis inhibitory, antioxidant, anti-inflammatory activities as well as the anti-atherogenic potential of EBN using mouse macrophage (RAW 264.7) and human monocytic (THP-1) cell lines.
iii. To determine the cholesterol-lowering and anti-atherogenic effects of EBN including transcriptional regulation of related genes in hypercholesterolemic-induced rabbit model.
iv. To determine the effects of EBN on vascular oxidative stress and inflammation including transcriptional regulation of related genes in hypercholesterolemic-induced rabbit model.

REFERENCES

Abbasalizad Farhangi, M., & Najafi, M. (2018). Dietary total antioxidant capacity (TAC) among candidates for coronary artery bypass grafting (CABG) surgery: Emphasis to possible beneficial role of TAC on serum vitamin D. *PLOS ONE*, *13*(12), e0208806. https://doi.org/10.1371/journal.pone.0208806

Abbate, A., Van Tassell, B. W., & Biondi-Zoccai, G. G. L. (2012). Blocking interleukin-1 as a novel therapeutic strategy for secondary prevention of cardiovascular events. *BioDrugs, 26*(4), 217–233. https://doi.org/10.1007/BF03261881

Abbate, J. M., Macrì, F., Capparucci, F., Iaria, C., Briguglio, G., Cicero, L., Salvo, A., Arfuso, F., Ieni, A., Piccione, G., & Lanteri, G. (2020). Administration of protein hydrolysates from anchovy (*Engraulis encrasicolus*) waste for twelve weeks decreases metabolic dysfunction-associated fatty liver disease severity in ApoE–/–mice. *Animals, 10*(12), 2303. https://doi.org/10.3390/ani10122303

Abbate, J. M., Macrì, F., Arfuso, F., Iaria, C., Capparucci, F., Anfuso, C., Ieni, A., Cicero, L., Briguglio, G., & Lanteri, G. (2021). Anti-atherogenic effect of 10% supplementation of anchovy (*Engraulis encrasicolus*) waste protein hydrolysates in ApoE-deficient mice. *Nutrients*, *13*(7), 2137. https://doi.org/10.3390/nu13072137

Adekunle, A. S., Adelusi, T. I., & Fatoki, J. A. (2013). Diet-induced hyperlipidemia and atherosclerosis in white rabbits. *Asian Journal of Pharmaceutical and Clinical Research*, *6*(2), 98–101.

Adeneye, A. A., Adeyemi, O. O., & Agbaje, E. O. (2010). Anti-obesity and antihyperlipidaemic effect of Hunteria umbellata seed extract in experimental hyperlipidaemia. *Journal of Ethnopharmacology, 130*(2), 307–314. https://doi.org/10.1016/j.jep.2010.05.009

Adhyapak, M. S. and Kachole, M. S. (2016). Investigation of adverse effects of interactions between herbal drugs and natural blood clotting mechanism. *Journal of Thrombosis and Thrombolysis, 41*(4), 644–647. https://doi.org/10.1007/s11239-015-1269-4

Afonso, M. S., Machado, R. M., Lavrador, M., Quintao, E. C. R., Moore, K., & Lottenberg, A. (2018). Molecular Pathways Underlying Cholesterol Homeostasis. *Nutrients*, *10*(6), 760. https://doi.org/10.3390/nu10060760

Akmal, M. N., Intan-Shameha, A. R., Ajat, M., Mansor, R., Zuki, A. B. Z., & Ideris, A. (2018). Edible bird's nest (EBN) supplementation ameliorates the progression of hepatic changes and atherosclerosis in hypercholesterolaemic-induced rats. *Malaysian Journal of Microscopy, 14,*103-114

Akmal, M. N., Abdul Razak, I.-S., Mansor, R., Ideris, A., Omar, A. R., Abu, J., & Ajat, M. (2020). High-dose edible bird's nest extract (EBN) upregulates LDL-R via suppression of HMGCR gene expression in HEPG2 cell lines. *Sains Malaysiana*, *49*(10), 2433–2442. https://doi.org/10.17576/jsm-2020-4910-09

Al Batran, R., Al-Bayaty, F., Al-Obaidi, M. M. J., Hussain, S. F., & Mulok, T. Z. (2014). Evaluation of the effect of andrographolide on atherosclerotic rabbits induced byporphyromonas gingivalis. *BioMed Research International*, *2014*, 1–11. https://doi.org/10.1155/2014/724718

Alakolanga, A. G. A. W., Siriwardane, A. M. D. A., Savitri Kumar, N., Jayasinghe, L., Jaiswal, R., & Kuhnert, N. (2014). LC-MSn identification and characterization of the phenolic compounds from the fruits of *Flacourtia indica* (Burm. F.) Merr. and *Flacourtia inermis* Roxb. *Food Research International*, *62*, 388–396. https://doi.org/10.1016/j.foodres.2014.03.036

AlAli, M., Alqubaisy, M., Aljaafari, M. N., AlAli, A. O., Baqais, L., Molouki, A., Abushelaibi, A., Lai, K.-S., & Lim, S.-H. E. (2021). Nutraceuticals: Transformation of conventional foods into health promoters/disease preventers and safety considerations. *Molecules*, *26*(9), 2540. https://doi.org/10.3390/molecules26092540

Alarcon, G., Roco, J., Medina, M., Medina, A., Peral, M., & Jerez, S. (2018). High fat diet-induced metabolically obese and normal weight rabbit model shows early vascular dysfunction: Mechanisms involved. *International Journal of Obesity*, *42*(9), 1535–1543. https://doi.org/10.1038/s41366-018-0020-6

Albishtue, A. A., Yimer, N., Zakaria, M. Z. A., Haron, A. W., Babji, A. S., Abubakar, A. A., & Almhanawi, B. H. (2019). Effects of EBN on embryo implantation, plasma concentrations of reproductive hormones, and uterine expressions of genes of PCNA, steroids, growth factors and their receptors in rats. *Theriogenology*, *126*, 310–319. https://doi.org/10.1016/j.theriogenology.2018.12.026

Albuquerque, T. G., Oliveira, M. B. P. P., Sanches-Silva, A., & Costa, H. S. (2016). Cholesterol determination in foods: comparison between high performance and ultra-high performance liquid chromatography. *Food Chemistry*, *193*, 18–25. https://doi.org/10.1016/j.foodchem.2014.09.109

Alfarisi, H. A. H., Ibrahim, M. B., Mohamed, Z. B. H., Azahari, N., Hamdan, A. H. Bt., & Che Mohamad, C. A. (2020). Hepatoprotective effects of a novel trihoney against nonalcoholic fatty liver disease: a comparative study with atorvastatin. *The Scientific World Journal*, *2020*, 1–14. https://doi.org/10.1155/2020/4503253

Ali, A. A. M., Noor, H. S. M., Chong, P. K., Babji, A. S., & Lim, S. J. (2019). Comparison of amino acids profile and antioxidant activities between edible bird nest and chicken egg. *Malaysian Applied Biology*, *48*(2), 63–69.

Almaraz, R.T., Tian.Y., Bhattarcharya. R., Tan, E., Chen, S.H., Dallas, M.R. et al. (2012). Metabolic flux increases glycoprotein sialylation: Implications for cell adhesion and cancer metastasis. *Molecular & Cellular Proteomics. 11*(7): M112.017558. https://doi: http://dx.doi.org/10.1074/mcp.M112.017558

Almowallad, S., Huwait, E., Al-Massabi, R., Saddeek, S., Gauthaman, K., & Prola, A. (2020). Punicalagin regulates key processes associated with atherosclerosis in THP-1 cellular model. *Pharmaceuticals*, *13*(11), 372. https://doi.org/10.3390/ph13110372

Al-Naqeb, G., Ismail, M., Bagalkotkar, G., & Adamu, H. A. (2010). Vanillin rich fraction regulates LDLR and HMGCR gene expression in HepG2 cells. *Food Research International*, *43*(10), 2437–2443. https://doi.org/10.1016/j.foodres.2010.09.015

Aluganti Narasimhulu, C., Selvarajan, K., Brown, M., & Parthasarathy, S. (2014). Cationic peptides neutralize Ox-LDL, prevent its uptake by macrophages, and attenuate inflammatory response. *Atherosclerosis*, *236*(1), 133–141. https://doi.org/10.1016/j.atherosclerosis.2014.06.020

American Heart Association. (2012). *Familial Hypercholesterolemia (FH)*. Www.heart.org. https://www.heart.org/en/health-topics/cholesterol/causes-of-high-cholesterol/familial-hypercholesterolemia-fh

Amor, A. J., & Perea, V. (2019). Dyslipidemia in nonalcoholic fatty liver disease. *Current Opinion in Endocrinology, Diabetes & Obesity, 26*(2), 103–108. https://doi.org/10.1097/MED.0000000000000464

Andrés-Manzano, M. J., Andrés, V., & Dorado, B. (2015). Oil red o and hematoxylin and eosin staining for quantification of atherosclerosis burden in mouse aorta and aortic root. *Methods in Molecular Biology*, 85–99. https://doi.org/10.1007/978-1-4939-2929-0_5

AOAC. Method 991.14. In *Official Methods of Analysis of AOAC International*, 17th ed; AOAC: Gaithersburg, MD, USA, 1995; p. 22–23.

Arana-Peña, S., Carballares, D., Berenguer-Murcia, Á., Alcántara, A., Rodrigues, R., & Fernandez-Lafuente, R. (2020). One pot use of combilipases for full modification of oils and fats: multifunctional and heterogeneous substrates. *Catalysts*, *10*(6), 605. https://doi.org/10.3390/catal10060605

Arjuman, A., & Chandra, N. C. (2017). LOX-1: A potential target for therapy in atherosclerosis; an *in vitro* study. *The International Journal of Biochemistry & Cell Biology*, *91*, 65–80. https://doi.org/10.1016/j.biocel.2017.08.013

Asgari, S., Abdi, H., Hezaveh, A. M., Moghisi, A., Etemad, K., Beni, H. R., & Khalili, D. (2018). The burden of statin therapy based on ACC/AHA and NCEP ATP-III guidelines: An Iranian survey of non-communicable diseases risk factors. *Scientific Reports*, *8*(1). https://doi.org/10.1038/s41598-018-23364-9

Ashry, N. A., Abdelaziz, R. R., Suddek, G. M., & Saleh, M. A. (2021). Canagliflozin ameliorates aortic and hepatic dysfunction in dietary-induced hypercholesterolemia in the rabbit. *Life Sciences, 280*, 119731. https://doi.org/10.1016/j.lfs.2021.119731

Aswir, A. R., & Wan Nazaimoon, W. M. (2011). Effect of edible bird's nest on cell proliferation and tumor necrosis factor- alpha (TNF-α) release in vitro. *International Food Research Journal*, *18*(3), 1123–1127.

Avci, E., Dolapoglu, A., & Akgun, D. E. (2018). Role of cholesterol as a risk factor in cardiovascular diseases. *Cholesterol - Good, Bad and the Heart*. https://doi.org/10.5772/intechopen.76357

Azmi, N. A., Lee, T. H., Lee, C. H., Hamdan, N., & Cheng, K. K. (2021). Differentiation unclean and cleaned edible bird's nest using multivariate analysis of amino acid composition data. *Pertanika Journal of Science and Technology*, *29*(1). https://doi.org/10.47836/pjst.29.1.36

Babji, A. S., Nurfatin, M. H., Etty Syarmila, I. K., & Masitah, M. (2015). Secrets of edible bird nest. Eprints.utar.edu.my. http://eprints.utar.edu.my/id/eprint/1678

Babji A., Etty Syarmila I., Nur'Aliah D., Nurul Nadia M., Hadi Akbar D., Norrakiah A., et al. (2018). Assessment on bioactive components of hydrolysed edible bird nest. *International Food Research Journal, 25*(5), 1936–1941.

Ballestri, S., Lonardo, A., Bonapace, S., Byrne, C.D., Loria, P. and Targher, G. (2014). Risk of cardiovascular, cardiac and arrhythmic complications in patients with non-alcoholic fatty liver disease. *World J Gastroenterol, 20*:1724-1745

Baltieri, N., Guizoni, D. M., Victorio, J. A., & Davel, A. P. (2018). Protective role of perivascular adipose tissue in endothelial dysfunction and insulin-induced vasodilatation of hypercholesterolemic LDL receptor-deficient mice. *Frontiers in Physiology*, *9*. https://doi.org/10.3389/fphys.2018.00229

Bandyopadhyay, D., Qureshi, A., Ghosh, S., Ashish, K., Heise, L. R., Hajra, A., & Ghosh, R. K. (2018). Safety and efficacy of extremely low LDL-cholesterol levels and its prospects in hyperlipidemia management. *Journal of Lipids*, *2018*, 1–8. https://doi.org/10.1155/2018/8598054

Bashir, M. J. K., Xian, T. M., Shehzad, A., Sethupahi, S., Choon Aun, N., & Abu Amr, S. (2017). Sequential treatment for landfill leachate by applying coagulation-adsorption process. *Geosystem Engineering*, *20*(1), 9–20. https://doi.org/10.1080/12269328.2016.1217798

Baskaran, G., Salvamani, S., Azlan, A., Ahmad, S. A., Yeap, S. K., & Shukor, M. Y. (2015a). Hypocholesterolemic and antiatherosclerotic potential of *Basella alba* leaf extract in hypercholesterolemia-induced rabbits. *Evidence-Based Complementary and Alternative Medicine*, *2015*, 1–7. https://doi.org/10.1155/2015/751714

Baskaran, G., Shukor, M. Y., Salvamani, S., Ahmad, S. A., Shaharuddin, N. A., & Pattiram, P. D. (2015b). HMG-CoA reductase inhibitory activity and phytocomponent investigation of *Basella alba* leaf extract as a treatment for hypercholesterolemia. *Drug Design, Development and Therapy*, 509. https://doi.org/10.2147/dddt.s75056

Battelli, M. G., Polito, L., & Bolognesi, A. (2014). Xanthine oxidoreductase in atherosclerosis pathogenesis: Not only oxidative stress. *Atherosclerosis*, *237*(2), 562–567. https://doi.org/10.1016/j.atherosclerosis.2014.10.006

Bays, H. E., Evans, J. L., Maki, K. C., Evans, M., Maquet, V., Cooper, R., & Anderson, J. W. (2012). Chitin-glucan fiber effects on oxidized low-density lipoprotein: a randomized controlled trial. *European Journal of Clinical Nutrition*, *67*(1), 2–7. https://doi.org/10.1038/ejcn.2012.121

Beinke, S., & Ley, S.C. (2004). Functions of NF-κB1 and NF-κB2 in immune cell biology. *Biochemical Journal*, *382*(2), 393–409. https://doi.org/10.1042/bj20040544

Benedé, S., & Molina, E. (2020). Chicken egg proteins and derived peptides with antioxidant properties. *Foods,* *9*(6), 735. https://doi.org/10.3390/foods9060735

Benjamin, E. J., Virani, S. S., Callaway, C. W., Chamberlain, A. M., Chang, A. R., Cheng, S., Chiuve, S. E., Cushman, M., Delling, F. N., Deo, R., de Ferranti, S. D., Ferguson, J. F., Fornage, M., Gillespie, C., Isasi, C. R., Jiménez, M. C., Jordan, L. C., Judd, S. E., Lackland, D., & Lichtman, J. H. (2018). Heart Disease and Stroke Statistics-2018 Update: A Report From the American Heart Association. *Circulation*, *137*(12), e67–e492. https://doi.org/10.1161/CIR.0000000000000558

Bentzon, J. F., Otsuka, F., Virmani, R., & Falk, E. (2014). Mechanisms of plaque formation and rupture. *Circulation Research*, *114*(12), 1852–1866. https://doi.org/10.1161/circresaha.114.302721

Berecochea-Lopez, A., Decordé, K., Ventura, E., Godard, M., Bornet, A., Teissèdre, P.-L., Cristol, J.-P., & Rouanet, J.-M. (2009). Fungal chitin−glucan from *Aspergillus niger* efficiently reduces aortic fatty streak accumulation in the high-fat fed hamster, an animal model of nutritionally induced atherosclerosis. *Journal of Agricultural and Food Chemistry*, *57*(3), 1093–1098. https://doi.org/10.1021/jf803063v

Bester, J., & Pretorius, E. (2016). Effects of IL-1β, IL-6 and IL-8 on erythrocytes, platelets and clot viscoelasticity. *Scientific Reports*, *6*(1), 1–10. https://doi.org/10.1038/srep32188

Bezerra, R. M., Costa, F. G. P., Givisiez, P. E. N., Goulart, C. C., Santos, R. A. dos, & Lima, M. R. (2015). Glutamic acid supplementation on low protein diets for laying hens. *Acta Scientiarum. Animal Sciences*, *37*(2), 129. https://doi.org/10.4025/actascianimsci.v37i2.25911.

Bhardwaj, S., Bhattacharjee, J., Bhatnagar, M. K. and Tyagi, S. (2013). Atherogenic index of plasma, Castelli risk index and atherogenic coefficient new parameters in assessing cardiovascular risk*. Int. J. Pharm. Biol. Sci, 3*, 359–364.

Bieghs, V., Rensen, P. C. N., Hofker, M. H., & Shiri-Sverdlov, R. (2012). NASH and atherosclerosis are two aspects of a shared disease: Central role for macrophages. *Atherosclerosis*, *220*(2), 287–293. https://doi.org/10.1016/j.atherosclerosis.2011.08.041

Bilotta, M. T., Petillo, S., Santoni, A., & Cippitelli, M. (2020). Liver X receptors: Regulators of cholesterol metabolism, inflammation, autoimmunity, and cancer. *Frontiers in Immunology*, *11*. https://doi.org/10.3389/fimmu.2020.584303

Birben, E., Sahiner, U. M., Sackesen, C., Erzurum, S., & Kalayci, O. (2012). Oxidative stress and antioxidant defense. *World Allergy Organization Journal*, *5*(1), 9–19. https://doi.org/10.1097/wox.0b013e3182439613

Biswas, I., & Khan, G. A. (2019). Endothelial dysfunction in cardiovascular diseases. *Basic and Clinical Understanding of Microcirculation*. https://doi.org/10.5772/intechopen.89365

Björnsson, E. S. (2016). Hepatotoxicity of statins and other lipid-lowering agents. *Liver International*, *37*(2), 173–178. https://doi.org/10.1111/liv.13308

Blachier, F., Wu, G., & Yin, Y. (2013). Nutritional and Physiological Functions of Amino Acids in Pigs. Vienna Springer.

Bobryshev, Y. V., Ivanova, E. A., Chistiakov, D. A., Nikiforov, N. G., & Orekhov, A. N. (2016). Macrophages and their role in atherosclerosis: Pathophysiology and transcriptome analysis. *BioMed Research International*, *2016*, 1–13. https://doi.org/10.1155/2016/9582430

Bonamassa, B., & Moschetta, A. (2013). Atherosclerosis: lessons from LXR and the intestine. *Trends in Endocrinology & Metabolism*, *24*(3), 120–128. https://doi.org/10.1016/j.tem.2012.10.004

Bonapace, S., Valbusa, F., Bertolini, L., Pichiri, I., Mantovani, A., Rossi, A., Zenari, L., Barbieri, E., & Targher, G. (2014). Nonalcoholic fatty liver disease is associated with aortic valve sclerosis in patients with type 2 diabetes mellitus. *PLoS ONE*, *9*(2), e88371. https://doi.org/10.1371/journal.pone.0088371

Bonaterra, G. A., Bender, K., Wilhelm, B., Schwarzbach, H., Metz, S., Kelber, O., Weiser, D., Metz, J., & Kinscherf, R. (2020). Effect of cholesterol re-supplementation and atorvastatin on plaque composition in the thoracic aorta of New Zealand white rabbits. *BMC Cardiovascular Disorders, 20*(1), 420. https://doi.org/10.1186/s12872-020-01703-x.

Borén, J., Chapman, M. J., Krauss, R. M., Packard, C. J., Bentzon, J. F., Binder, C. J., Daemen, M. J., Demer, L. L., Hegele, R. A., Nicholls, S. J., Nordestgaard, B. G., Watts, G. F., Bruckert, E., Fazio, S., Ference, B. A., Graham, I., Horton, J. D., Landmesser, U., Laufs, U., & Masana, L. (2020). Low-density lipoproteins cause atherosclerotic cardiovascular disease: pathophysiological, genetic, and therapeutic insights: a consensus statement from the European Atherosclerosis Society Consensus Panel. *European Heart Journal*, *41*(24). https://doi.org/10.1093/eurheartj/ehz962

Borissoff, J. I., Heeneman, S., Kilinç, E., Kaššák, P., Van Oerle, R., Winckers, K., Govers-Riemslag, J. W. P., Hamulyák, K., Hackeng, T. M., Daemen, M. J. A. P., ten Cate, H. and Spronk, H. M. H. (2010). Early atherosclerosis exhibits an enhanced procoagulant state. *Circulation, 122*(8), 821–830. https://doi.org/10.1161/CIRCULATIONAHA.109.907121

Bovet, P. and Paccaud, F. (2011). Cardiovascular disease and the changing face of global public health: A focus on low and middle income countries. *Public Health Reviews, 33*, 397–415.

Bozaykut, P., Karademir, B., Yazgan, B., Sozen, E., Siow, R. C. M., Mann, G. E., & Ozer, N. K. (2014). Effects of vitamin E on peroxisome proliferator-activated receptor γ and nuclear factor-erythroid 2-related factor 2 in hypercholesterolemia-induced atherosclerosis. *Free Radical Biology and Medicine*, *70*, 174–181. https://doi.org/10.1016/j.freeradbiomed.2014.02.017

Bozzetto, L., Costabile, G., Della Pepa, G., Ciciola, P., Vetrani, C., Vitale, M., Rivellese, A. A., & Annuzzi, G. (2018). Dietary fibre as a unifying remedy for the whole spectrum of obesity-associated cardiovascular risk. *Nutrients*, *10*(7). https://doi.org/10.3390/nu10070943

Brites, F., Martin, M., Guillas, I., & Kontush, A. (2017). Antioxidative activity of high-density lipoprotein (HDL): Mechanistic insights into potential clinical benefit. *BBA Clinical*, *8*, 66–77. https://doi.org/10.1016/j.bbacli.2017.07.002

Brophy, M. L., Dong, Y., Wu, H., Rahman, H. N. A., Song, K., & Chen, H. (2017). Eating the dead to keep atherosclerosis at bay. *Frontiers in Cardiovascular Medicine, 4*(2). https://doi.org/10.3389/fcvm.2017.00002

Brown, A. J., & Sharpe, L. J. (2016). Cholesterol synthesis. *Biochemistry of Lipids, Lipoproteins and Membranes*, 327–358. https://doi.org/10.1016/b978-0-444-63438-2.00011-0

Brown, M. S., Radhakrishnan, A., & Goldstein, J. L. (2018). Retrospective on cholesterol homeostasis: The central role of scap. *Annual Review of Biochemistry*, *87*(1), 783–807. https://doi.org/10.1146/annurev-biochem-062917-011852

Brozovich, F. V., Nicholson, C. J., Degen, C. V., Gao, Y. Z., Aggarwal, M., & Morgan, K. G. (2016). Mechanisms of vascular smooth muscle contraction and the basis for pharmacologic treatment of smooth muscle disorders. *Pharmacological Reviews*, *68*(2), 476–532. https://doi.org/10.1124/pr.115.010652

Brunham, L. R., & Hayden, M. R. (2015). Human genetics of HDL: Insight into particle metabolism and function. *Progress in Lipid Research*, *58*, 14–25. https://doi.org/10.1016/j.plipres.2015.01.001

Brunner A., Henn C., Drewniak E., Lesieur-Brooks A., Machan J., Crisco J., & Ehrlich M. (2012). High dietary fat and the development of osteoarthritis in a rabbit model. *Osteoarthritis Cartilage, 20*, 584–592. doi: 10.1016/j.joca.2012.02.007.

Buqué, X., Martínez, M. J., Cano, A., Miquilena-Colina, M. E., García-Monzón, C., Aspichueta, P., & Ochoa, B. (2010). A subset of dysregulated metabolic and survival genes is associated with severity of hepatic steatosis in obese Zucker rats. *Journal of Lipid Research*, *51*(3), 500–513. https://doi.org/10.1194/jlr.m001966

Careena, S., Sani, D., Tan, S. N., Lim, C. W., Hassan, S., Norhafizah, M., Kirby, B. P., Ideris, A., Stanslas, J., Bin Basri, H., & Lim, C. T. S. (2018). Effect of edible bird's nest extract on lipopolysaccharide-induced impairment of learning and memory in wistar rats. *Evidence-Based Complementary and Alternative Medicine*, *2018*, 1–7. https://doi.org/10.1155/2018/9318789

Catapano, A. L., Graham, I., De Backer, G., Wiklund, O., Chapman, M. J., Drexel, H., Hoes, A. W., Jennings, C. S., Landmesser, U., Pedersen, T. R., Reiner, Ž., Riccardi, G., Taskinen, M.-R., Tokgozoglu, L., Verschuren, W. M. M., Vlachopoulos, C., Wood, D. A., & Zamorano, J. L. (2016). 2016 ESC/EAS guidelines for the management of dyslipidaemias. *Atherosclerosis*, *253*, 281–344. https://doi.org/10.1016/j.atherosclerosis.2016.08.018

Čejková, S., Králová Lesná, I., & Poledne, R. (2016). Monocyte adhesion to the endothelium is an initial stage of atherosclerosis development. *Cor et Vasa*, *58*(4), e419–e425. https://doi.org/10.1016/j.crvasa.2015.08.002

Cerqueira, N. M. F. S. A., Oliveira, E. F., Gesto, D. S., Santos-Martins, D., Moreira, C., Moorthy, H. N., Ramos, M. J., & Fernandes, P. A. (2016).

Cholesterol biosynthesis: A mechanistic overview. *Biochemistry*, *55*(39), 5483–5506. https://doi.org/10.1021/acs.biochem.6b00342

Chalamaiah, M., Dinesh kumar, B., Hemalatha, R., & Jyothirmayi, T. (2012). Fish protein hydrolysates: Proximate composition, amino acid composition, antioxidant activities and applications: A review. *Food Chemistry*, *135*(4), 3020–3038. https://doi.org/10.1016/j.foodchem.2012.06.100.

Chalamaiah, M., Yu, W., & Wu, J. (2018). Immunomodulatory and anticancer protein hydrolysates (peptides) from food proteins: A review. *Food Chemistry*, *245*, 205–222. https://doi.org/10.1016/j.foodchem.2017.10.087.

Chan, K. W., Khong, N. M. H., Iqbal, S., Umar, I. M., & Ismail, M. (2012). Antioxidant property enhancement of sweet potato flour under simulated gastrointestinal pH. *International Journal of Molecular Sciences*, 13(7), 8987–8997.

Chan, G. H., Law, B. Y., Chu, J. M., Yue, K. K., Jiang, Z., Lau, C., Huang, Y., Chan, S., Ying-kit Yue, P., & Wong, R. N. (2013a). ginseng extracts restore high-glucose induced vascular dysfunctions by altering triglyceride metabolism and downregulation of atherosclerosis-related genes. *Evidence-Based Complementary and Alternative Medicine*, *2013*, 1–13. https://doi.org/10.1155/2013/797310

Chan, K. W., Khong, N. M. H., Iqbal, S., & Ismail, M. (2013b). Isolation and antioxidative properties of phenolics-saponins rich fraction from defatted rice bran. *Journal of Cereal Science*, 57(3), 480–485.

Chan, K. W., Iqbal, S., Khong, N. M. H., Ooi, D.-J., & Ismail, M. (2014). Antioxidant activity of phenolics–saponins rich fraction prepared from defatted kenaf seed meal. *LWT - Food Science and Technology*, 56(1), 181–186.

Chan, G. K. L., Wong, Z. C. F., Lam, K. Y. C., Cheng, L. K. W., Zhang, L. M., Lin, H., Dong, T. T., & Tsim, K. W. K. (2015). Edible bird's nest, an asian health food supplement, possesses skin lightening activities: identification of *N*-acetylneuraminic acid as active ingredient. *Journal of Cosmetics, Dermatological Sciences and Applications*, *05*(04), 262–274. https://doi.org/10.4236/jcdsa.2015.54032

Chan, K. W., Ismail, M., Mohd Esa, N., Imam, M. U., Ooi, D. J., & Khong, N. M. H. (2018). Dietary supplementation of defatted kenaf (*Hibiscus cannabinus L*.) seed meal and its phenolics–saponins rich extract effectively attenuates diet-induced hypercholesterolemia in rats. *Food & Function*, *9*(2), 925–936. https://doi.org/10.1039/c7fo01109a

Chang, H.-H., Chien, C.-Y., Chen, K.-H., Huang, S.-C., & Chien, C.-T. (2017). Catechins blunt the effects of oxLDL and its primary metabolite phosphatidylcholine hydroperoxide on endothelial dysfunction through inhibition of oxidative stress and restoration of eNOS in rats. *Kidney and*

Blood Pressure Research, *42*(5), 919–932. https://doi.org/10.1159/000485082

Chapin, J. C., & Hajjar, K. A. (2015). Fibrinolysis and the control of blood coagulation. *Blood Reviews*, *29*(1), 17–24. https://doi.org/10.1016/j.blre.2014.09.003

Charlton-Menys, V., & Durrington, P. N. (2007). Human cholesterol metabolism and therapeutic molecules. *Experimental Physiology*, *93*(1), 27–42. https://doi.org/10.1113/expphysiol.2007.035147

Chen, Q., Wang, Q., Zhu, J., Xiao, Q., & Zhang, L. (2018). Reactive oxygen species: Key regulators in vascular health and diseases. *British Journal of Pharmacology*, *175*(8), 1279–1292. https://doi.org/10.1111/bph.13828

Cheng, F., Torzewski, M., Degreif, A., Rossmann, H., Canisius, A., & Lackner, K. J. (2013). Impact of Glutathione Peroxidase-1 Deficiency on Macrophage Foam Cell Formation and Proliferation: Implications for Atherogenesis. *PLoS ONE*, *8*(8), e72063. https://doi.org/10.1371/journal.pone.0072063

Chiang, J. Y. L. (2013). Bile Acid metabolism and signaling. *Comprehensive Physiology*, *3*(3). https://doi.org/10.1002/cphy.c120023

Chiang, J. Y. L., & Ferrell, J. M. (2020). Up to date on cholesterol 7 alpha-hydroxylase (CYP7A1) in bile acid synthesis. *Liver Research*, *4*(2), 47–63. https://doi.org/10.1016/j.livres.2020.05.001

Chien, S.-C., Chen, P.-S., Huang, Y.-H., Tang, S.-C., Li, Y.-H., & Yeh, H.-I. (2019). 2019 Taiwan society of lipids and atherosclerosis expert consensus statement on statin intolerance. *Journal of the Formosan Medical Association*, *118*(10), 1385–1392. https://doi.org/10.1016/j.jfma.2018.11.017

Chistiakov, D. A., Bobryshev, Y. V., & Orekhov, A. N. (2015). Macrophage-mediated cholesterol handling in atherosclerosis. *Journal of Cellular and Molecular Medicine*, *20*(1), 17–28. https://doi.org/10.1111/jcmm.12689

Chistiakov, D. A., Grechko, A. V., Myasoedova, V. A., Melnichenko, A. A., & Orekhov, A. N. (2018). The role of monocytosis and neutrophilia in atherosclerosis. *Journal of Cellular and Molecular Medicine*, *22*(3), 1366–1382. https://doi.org/10.1111/jcmm.13462

Cho, A., Christine, M., Malicdan, V., Miyakawa, M., Nonaka, I., Nishino, I., & Noguchi, S. (2017). Sialic acid deficiency is associated with oxidative stress leading to muscle atrophy and weakness in GNE myopathy. *Human Molecular Genetics*, *26*(16), 3081–3093. https://doi.org/10.1093/hmg/ddx192

Choi, S., Park, M., Kim, J., Park, W., Kim, S., Lee, D.-K., Hwang, J. Y., Choe, J., Won, M.-H., Ryoo, S., Ha, K.-S., Kwon, Y.-G., & Kim, Y.-M. (2018). TNF-α elicits phenotypic and functional alterations of vascular smooth muscle cells by miR-155-5p–dependent down-regulation of cGMP-dependent kinase 1. *Journal of Biological Chemistry, 293*(38), 14812–14822. https://doi.org/10.1074/jbc.ra118.004220

Chok, K. C., Ng, M. G., Ng, K. Y., Koh, R. Y., Tiong, Y. L., & Chye, S. M. (2021). Edible bird's nest: Recent updates and industry insights based on laboratory findings. *Frontiers in Pharmacology*, *12*. https://doi.org/10.3389/fphar.2021.746656

Chua, K.-H., Lee, T.-H., Nagandran, K., Md Yahaya, N. H., Lee, C.-T., Tjih, E. T. T., et al. (2013). Edible bird's nest extract as a chondro-protective agent for human chondrocytes isolated from osteoarthritic knee: *In vitro* study. *BMC Complementary and Alternative Medicine, 13*(1), 1–9. doi:10.1186/1472-6882-13-19

Chua, Y. G., Bloodworth, B. C., Leong, L. P., & Li, S. F. Y. (2014). Metabolite profiling of edible bird's nest using gas chromatography/mass spectrometry and liquid chromatography/mass spectrometry. *Rapid Communications in Mass Spectrometry*, *28*(12), 1387–1400. https://doi.org/10.1002/rcm.6914

Chua, L. S., & Zukefli, S. N. (2016). A comprehensive review of edible bird nests and swiftlet farming. *Journal of Integrative Medicine*, *14*(6), 415–428. https://doi.org/10.1016/s2095-4964(16)60282-0

Chua, K. H., Mohamed, I. N., Mohd Yunus, M. H., Shafinaz Md Nor, N., Kamil, K., Ugusman, A., & Kumar, J. (2021). The anti-viral and anti-inflammatory properties of edible bird's nest in influenza and coronavirus infections: From pre-clinical to potential clinical application. *Frontiers in Pharmacology, 12*: 633292. https://doi.org/10.3389/fphar.2021.633292

Cicalese, S., Okuno, K., Elliott, K. J., Kawai, T., Scalia, R., Rizzo, V., & Eguchi, S. (2020). 78 kDa glucose-regulated protein attenuates protein aggregation and monocyte adhesion induced by angiotensin ii in vascular cells. *International Journal of Molecular Sciences*, *21*(14), 4980. https://doi.org/10.3390/ijms21144980

Cicero, A. F. G., Colletti, A., Bajraktari, G., Descamps, O., Djuric, D. M., Ezhov, M., Fras, Z., Katsiki, N., Langlois, M., Latkovskis, G., Panagiotakos, D. B., Paragh, G., Mikhailidis, D. P., Mitchenko, O., Paulweber, B., Pella, D., Pitsavos, C., Reiner, Ž., Ray, K. K., & Rizzo, M. (2017). Lipid lowering nutraceuticals in clinical practice: position paper from an International Lipid Expert Panel. *Archives of Medical Science*, *5*, 965–1005. https://doi.org/10.5114/aoms.2017.69326

Cicha, I., & Urschel, K. (2015). TNF-α in the cardiovascular system: from physiology to therapy. *International Journal of Interferon, Cytokine and Mediator Research, 9*. https://doi.org/10.2147/ijicmr.s64894

Cipollone, F., Mezzetti, A., Fazia, M. L., Cuccurullo, C., Iezzi, A., Ucchino, S., Spigonardo, F., Bucci, M., Cuccurullo, F., Prescott, S. M., & Stafforini, D. M. (2005). Association between 5-lipoxygenase expression and plaque instability in humans. *Arteriosclerosis, Thrombosis, and Vascular Biology*, *25*(8), 1665–1670. https://doi.org/10.1161/01.atv.0000172632.96987.2d

Coelho, I., Duarte, N., Macedo, M. P., & Penha-Gonçalves, C. (2021). Insights into macrophage/monocyte-endothelial cell crosstalk in the liver: A role for trem-2. *Journal of Clinical Medicine*, *10*(6), 1248. https://doi.org/10.3390/jcm10061248

Collin, F. (2019). Chemical basis of reactive oxygen species reactivity and involvement in neurodegenerative diseases. *International Journal of Molecular Sciences*, *20*(10). https://doi.org/10.3390/ijms20102407

Colmán-Martínez, M., Martínez-Huélamo, M., Valderas-Martínez, P., Arranz-Martínez, S., Almanza-Aguilera, E., Corella, D., Estruch, R., & Lamuela-Raventós, R. M. (2017). Trans -Lycopene from tomato juice attenuates inflammatory biomarkers in human plasma samples: An intervention trial. *Molecular Nutrition & Food Research*, *61*(11), 1600993. https://doi.org/10.1002/mnfr.201600993

Colucci, R., Fornai, M., Duranti, E., Antonioli, L., Rugani, I., Aydinoglu, F., Ippolito, C., Segnani, C., Bernardini, N., Taddei, S., Blandizzi, C., & Virdis, A. (2013). Rosuvastatin prevents angiotensin II-induced vascular changes by inhibition of NAD(P)H oxidase and COX-1. *British Journal of Pharmacology*, *169*(3), 554–566. https://doi.org/10.1111/j.1476-5381.2012.02106.x

Cortés-Herrera, C., Artavia, G., Leiva, A., & Granados-Chinchilla, F. (2018). Liquid Chromatography Analysis of Common Nutritional Components, in Feed and Food. *Foods*, *8*(1), 1. https://doi.org/10.3390/foods8010001

Craig, M., & Malik, A. (2020). *Biochemistry, Cholesterol*. PubMed; StatPearls Publishing. https://www.ncbi.nlm.nih.gov/books/NBK513326/

Csonka, C., Sárközy, M., Pipicz, M., Dux, L., & Csont, T. (2016). Modulation of hypercholesterolemia-induced oxidative/nitrative stress in the heart. *Oxidative Medicine and Cellular Longevity*, *2016*, 1–23. https://doi.org/10.1155/2016/3863726

Cunningham, R. P., Sheldon, R. D., & Rector, R. S. (2020). The emerging role of hepatocellular eNOS in non-alcoholic fatty liver disease development. *Frontiers in Physiology, 11*, 767. https://doi.org/10.3389/fphys.2020.00767

Dai, Y., Cao, J., Wang, Y., Chen, Y., & Jiang, L. (2020). A comprehensive review of edible bird’s nest. *Food Research International*, *140*: 109875. https://doi.org/10.1016/j.foodres.2020.109875

Dalangin, R., Kim, A., & Campbell, R. E. (2020). The role of amino acids in neurotransmission and fluorescent tools for their detection. *International Journal of Molecular Sciences*, *21*(17), 6197. https://doi.org/10.3390/ijms21176197

Danielewski, M., Kucharska, A. Z., Matuszewska, A., Rapak, A., Gomułkiewicz, A., Dzimira, S., Dzięgiel, P., Nowak, B., Trocha, M., Magdalan, J., Piórecki, N., Szeląg, A., & Sozański, T. (2021). Cornelian Cherry (*Cornus mas L.*) Iridoid and anthocyanin extract enhances PPAR-α, PPAR-γ expression and reduces I/M ratio in aorta, increases LXR-α expression and alters adipokines and triglycerides levels in cholesterol-rich diet rabbit model. *Nutrients*, *13*(10), 3621. https://doi.org/10.3390/nu13103621.

Das, K., & Roychoudhury, A. (2014). Reactive oxygen species (ROS) and response of antioxidants as ROS-scavengers during environmental stress in plants. *Frontiers in Environmental Science, 2*(53). https://doi.org/10.3389/fenvs.2014.00053

Daud, N., Mohamad Yusop, S., Babji, A. S., Lim, S. J., Sarbini, S. R., & Hui Yan, T. (2019a). Edible Bird's Nest: Physicochemical Properties, Production, and Application of Bioactive Extracts and Glycopeptides. *Food Reviews International*, 1–20. https://doi.org/10.1080/87559129.2019.1696359

Daud, N. 'Aliah, Sarbini, S. R., Babji, A. S., Mohamad Yusop, S., & Lim, S. J. (2019b). Characterization of edible swiftlet's nest as a prebiotic ingredient using a simulated colon model. *Annals of Microbiology*, *69*(12), 1235–1246. https://doi.org/10.1007/s13213-019-01507-1

Davignon, J. (2012). Pleiotropic effects of pitavastatin. *British Journal of Clinical Pharmacology*, *73*(4), 518–535. https://doi.org/10.1111/j.1365-2125.2011.04139.x

de Lima, S. L. S., Gomes, M. J. C., da Silva, B. P., Alves, N. E. G., Toledo, R. C. L., Theodoro, J. M. V., Moreira, M. E. de C., Bento, J. A. C., Bassinello, P. Z., da Matta, S. L. P., De Mejía, E. G., & Martino, H. S. D. (2019). Whole flour and protein hydrolysate from common beans reduce the inflammation in BALB/c mice fed with high fat high cholesterol diet. *Food Research International*, *122*, 330–339. https://doi.org/10.1016/j.foodres.2019.04.013

de Oliveira Andrade, L. (2016). Understanding the role of cholesterol in cellular biomechanics and regulation of vesicular trafficking: The power of imaging. *Biomedical Spectroscopy and Imaging*, *5*(s1), S101–S117. https://doi.org/10.3233/bsi-160157

de Wit, N., Derrien, M., Bosch-Vermeulen, H., Oosterink, E., Keshtkar, S., Duval, C., de Vogel-van den Bosch, J., Kleerebezem, M., Müller, M., & van der Meer, R. (2012). Saturated fat stimulates obesity and hepatic steatosis and affects gut microbiota composition by an enhanced overflow of dietary fat to the distal intestine. *American Journal of Physiology-*

Gastrointestinal and Liver Physiology, *303*(5), G589–G599. https://doi.org/10.1152/ajpgi.00488.2011

Deng, Z., Liu, Y., Liu, C., Xiang, X., Wang, J., Cheng, Z., Shah, S. V., Zhang, S., Zhang, L., Zhuang, X., Michalek, S., Grizzle, W. E., & Zhang, H.-G. (2009). Immature myeloid cells induced by a high-fat diet contribute to liver inflammation. *Hepatology*, *50*(5), 1412–1420. https://doi.org/10.1002/hep.23148

Deponte, M. (2013). Glutathione catalysis and the reaction mechanisms of glutathione-dependent enzymes. *Biochimica et Biophysica Acta (BBA) - General Subjects*, *1830*(5), 3217–3266. https://doi.org/10.1016/j.bbagen.2012.09.018

Deveaux, A., Pham, I., West, S.G., André, E., Lantoine-Adam, F., Bunouf, P., Sadi, S., Hermier, D., Mathé, V., Fouillet, H. et al. (2016). L-arginine supplementation alleviates postprandial endothelial dysfunction when baseline fasting plasma arginine concentration is low: A randomized controlled trial in healthy overweight adults with cardiometabolic risk factors. *The Journal of Nutrition*, *146*, 1330–1340.

Di Pietro, N., Formoso, G., & Pandolfi, A. (2016). Physiology and pathophysiology of oxLDL uptake by vascular wall cells in atherosclerosis. *Vascular Pharmacology*, *84*, 1–7. https://doi.org/10.1016/j.vph.2016.05.013

Diamantis, E., Kyriakos, G., Quiles-Sanchez, L. V., Farmaki, P., & Troupis, T. (2017). The anti-inflammatory effects of statins on coronary artery disease: An updated review of the literature. *Current Cardiology Reviews*, *13*(3), 209–216. https://doi.org/10.2174/1573403X13666170426104611

Ding, S., Jiang, J., Yu, P., Zhang, G., Zhang, G., & Liu, X. (2017). Green tea polyphenol treatment attenuates atherosclerosis in high-fat diet-fed apolipoprotein E-knockout mice via alleviating dyslipidemia and up-regulating autophagy. *PLoS ONE*, *12*(8), e0181666. https://doi.org/10.1371/journal.pone.0181666

Ding, L., Zhang, T.-T., Che, H.-X., Zhang, L.-Y., Xue, C.-H., Chang, Y.-G., & Wang, Y.-M. (2018). Saponins of sea cucumber attenuate atherosclerosis in ApoE−/− mice via lipid-lowering and anti-inflammatory properties. *Journal of Functional Foods*, *48*, 490–497. https://doi.org/10.1016/j.jff.2018.07.046

Du, H., van der A, D. L., Boshuizen, H. C., Forouhi, N. G., Wareham, N. J., Halkjær, J., Tjønneland, A., Overvad, K., Jakobsen, M. U., Boeing, H., Buijsse, B., Masala, G., Palli, D., Sørensen, T. I., Saris, W. H., & Feskens, E. J. (2009). Dietary fiber and subsequent changes in body weight and waist circumference in European men and women. *The American Journal of Clinical Nutrition*, *91*(2), 329–336. https://doi.org/10.3945/ajcn.2009.28191

Duarte, N., Coelho, I. C., Patarrão, R. S., Almeida, J. I., Penha-Gonçalves, C., & Macedo, M. P. (2015). How inflammation impinges on NAFLD: A role for kupffer cells. *BioMed Research International*, *2015*, 1–11. https://doi.org/10.1155/2015/984578

Dubland, J. A., & Francis, G. A. (2015). Lysosomal acid lipase: at the crossroads of normal and atherogenic cholesterol metabolism. *Frontiers in Cell and Developmental Biology*, *3*. https://doi.org/10.3389/fcell.2015.00003

Durrington, P., & Soran, H. (2014). Hyperlipidemia. *Metabolism of Human Diseases*, 295–302. https://doi.org/10.1007/978-3-7091-0715-7_43

Edible birds nest bowl shape by Edible birds nest. (2016). Wikimedia Commons,19 March 2016. https://commons.wikimedia.org/wiki/File:Edible-birds-nest-bowl-shape.png (accessed on 18 December 2021)

Effiong, G. S., & Akpan, H. D. (2015). The effect of *Nauclea latifolia* leaf extract on some biochemical parameters in streptozotocin diabetic rat models. *International Research Journal of Medicine and Medical Sciences*, *06*(03). https://doi.org/10.14303/jmms.2014.033

El Hadri, K., Smith, R., Duplus, E., & El Amri, C. (2021). Inflammation, oxidative stress, senescence in atherosclerosis: Thioredoxine-1 as an emerging therapeutic target. *International Journal of Molecular Sciences*, *23*(1), 77. https://doi.org/10.3390/ijms23010077

Esfandi, R., Walters, M. E., & Tsopmo, A. (2019). Antioxidant properties and potential mechanisms of hydrolyzed proteins and peptides from cereals. *Heliyon*, *5*(4), e01538. https://doi.org/10.1016/j.heliyon.2019.e01538

Fakurazi, S., Sharifudin, S. A., & Arulselvan, P. (2012). *Moringa oleifera* hydroethanolic extracts effectively alleviate acetaminophen-induced hepatotoxicity in experimental rats through their antioxidant nature. *Molecules*, *17*(7), 8334–8350. https://doi.org/10.3390/molecules17078334

Fan, J., Kitajima, S., Watanabe, T., Xu, J., Zhang, J., Liu, E., & Chen, Y. E. (2015). Rabbit models for the study of human atherosclerosis: From pathophysiological mechanisms to translational medicine. *Pharmacology & Therapeutics*, *0*, 104–119. https://doi.org/10.1016/j.pharmthera.2014.09.009

Fan, J., Liu, L., Liu, Q., Cui, Y., Yao, B., Zhang, M., Gao, Y., Fu, Y., Dai, H., Pan, J., Qiu, Y., Liu, C. H., He, F., Wang, Y., & Zhang, L. (2019). CKIP-1 limits foam cell formation and inhibits atherosclerosis by promoting degradation of Oct-1 by REGγ. *Nature Communications*, *10*(1). https://doi.org/10.1038/s41467-018-07895-3

Faridah Hanim, S., Azrina, A., Khoo, H. E. and Amin, I. (2015). Protective effects of pulp and kernel oils from *Canarium odontophyllum* fruit in normal and hypercholesterolemic rabbits. *International Food Research Journal*, *22*(4): 1318-1326.

Favari, E., Chroni, A., Tietge, U. J. F., Zanotti, I., Escolà-Gil, J. C., & Bernini, F. (2015). Cholesterol efflux and reverse cholesterol transport. *High Density Lipoproteins*, 181–206. https://doi.org/10.1007/978-3-319-09665-0_4

Feingold, K. R., & Grunfeld, C. (2018). *Introduction to Lipids and Lipoproteins*. MDText.com, Inc. https://www.ncbi.nlm.nih.gov/books/NBK305896/

Feng, D., Zou, J., Su, D., Mai, H., Zhang, S., Li, P., & Zheng, X. (2019). Curcumin prevents high-fat diet-induced hepatic steatosis in ApoE−/− mice by improving intestinal barrier function and reducing endotoxin and liver TLR4/NF-κB inflammation. *Nutrition & Metabolism*, *16*(1). https://doi.org/10.1186/s12986-019-0410-3

Ference, B. A., Ginsberg, H. N., Graham, I., Ray, K. K., Packard, C. J., Bruckert, E., Hegele, R. A., Krauss, R. M., Raal, F. J., Schunkert, H., Watts, G. F., Borén, J., Fazio, S., Horton, J. D., Masana, L., Nicholls, S. J., Nordestgaard, B. G., van de Sluis, B., Taskinen, M.-R., & Tokgözoğlu, L. (2017). Low-density lipoproteins cause atherosclerotic cardiovascular disease. 1. Evidence from genetic, epidemiologic, and clinical studies. A consensus statement from the European Atherosclerosis Society Consensus Panel. *European Heart Journal*, *38*(32), 2459–2472. https://doi.org/10.1093/eurheartj/ehx144

Flohé, L., Toppo, S., Cozza, G., & Ursini, F. (2011). A Comparison of Thiol Peroxidase Mechanisms. *Antioxidants & Redox Signaling*, *15*(3), 763–780. https://doi.org/10.1089/ars.2010.3397

Flores-Mateo, G., Carrillo-Santisteve, P., Elosua, R., Guallar, E., Marrugat, J., Bleys, J., & Covas, M.-I. (2009). Antioxidant enzyme activity and coronary heart disease: meta-analyses of observational studies. *American Journal of Epidemiology*, *170*(2), 135–147. https://doi.org/10.1093/aje/kwp112

Fogelman, Y., Gaitini, D., & Carmeli, E. (2016). Antiatherosclerotic effects of licorice extract supplementation on hypercholesterolemic patients: decreased CIMT, reduced plasma lipid levels, and decreased blood pressure. *Food & Nutrition Research*, *60*(1), 30830. https://doi.org/10.3402/fnr.v60.30830

Folch, J., Ascoli, I., Lees, M., Meath, J.A. and LeBaron, F.N. (1951). Preparation of lipid extracts from brain tissue. *Journal of Biological Chemistry, 191*(2), 833–841.

Förstermann, U., & Sessa, W. C. (2012). Nitric oxide synthases: regulation and function. *European Heart Journal*, *33*(7), 829–837, 837a837d. https://doi.org/10.1093/eurheartj/ehr304

Förstermann, U., Xia, N., & Li, H. (2017). Roles of vascular oxidative stress and nitric oxide in the pathogenesis of atherosclerosis. *Circulation Research*, *120*(4), 713–735. https://doi.org/10.1161/circresaha.116.309326

Fu, Z., Akula, S., Thorpe, M., & Hellman, L. (2021). Marked difference in efficiency of the digestive enzymes pepsin, trypsin, chymotrypsin, and pancreatic elastase to cleave tightly folded proteins. *Biological Chemistry*, *402*(7), 861–867. https://doi.org/10.1515/hsz-2020-0386

Fukai, T., & Ushio-Fukai, M. (2011). Superoxide dismutases: Role in redox signaling, vascular function, and diseases. *Antioxidants & Redox Signaling*, *15*(6), 1583–1606. https://doi.org/10.1089/ars.2011.3999

Fulcher, J., O'Connell, R., Voysey, M., Emberson, J., Blackwell, L., Mihaylova, B., Simes, J., Collins, R., Kirby, A., Colhoun, H. et al. (2015). Efficacy and safety of LDL-lowering therapy among men and women: Meta-analysis of individual data from 174 000 participants in 27 randomised trials. *The Lancet,* *385*(9976), 1397–1405. https://doi.org/10.1016/S0140-6736(14)61368-4

Gan, J. Y., Chang, L. S., Mat Nasir, N. A., Babji, A. S., & Lim, S. J. (2020). Evaluation of physicochemical properties, amino acid profile and bioactivities of edible Bird's nest hydrolysate as affected by drying methods. *LWT-Food Science and Technology*, *131*, 109777. https://doi.org/10.1016/j.lwt.2020.109777

Gao, F., Lucke-Wold, B. P., Li, X., Logsdon, A. F., Xu, L.-C., Xu, S., LaPenna, K. B., Wang, H., Talukder, M. A. H., Siedlecki, C. A., Huber, J. D., Rosen, C. L., & He, P. (2018). Reduction of endothelial nitric oxide increases the adhesiveness of constitutive endothelial membrane ICAM-1 through src-mediated phosphorylation. *Frontiers in Physiology*, *8*, 1124. https://doi.org/10.3389/fphys.2017.01124

Gao, R., Shu, W., Shen, Y., Sun, Q., Bai, F., Wang, J., Li, D., Li, Y., Jin, W., & Yuan, L. (2020). Sturgeon protein-derived peptides exert anti-inflammatory effects in LPS-stimulated RAW264.7 macrophages via the MAPK pathway. *Journal of Functional Foods*, *72*, 104044. https://doi.org/10.1016/j.jff.2020.104044

Garcia-Guinea, J., Jorge, A., Tormo, L., Furio, M., Crespo-Feo, E., Correcher, V., Prado-Herrero, P., Soria, A. C., Sanz, J., & Nieves-Aldrey, J. L. (2011). Ossification vesicles with calcium phosphate in the eyes of the Insect *Copium teucrii* (Hemiptera: Tingidae). *The Scientific World Journal*, *11*, 186–198. https://doi.org/10.1100/tsw.2011.9

Gaudet, A. D., & Popovich, P. G. (2014). Extracellular matrix regulation of inflammation in the healthy and injured spinal cord. *Experimental Neurology*, *258*, 24–34. https://doi.org/10.1016/j.expneurol.2013.11.020

Gaudio, E., Nobili, V., Franchitto, A., Onori, P., & Carpino, G. (2012). Nonalcoholic fatty liver disease and atherosclerosis. *Internal and Emergency Medicine*, *7 Suppl 3*, S297-305. https://doi.org/10.1007/s11739-012-0826-5

Ghassem, M., Arihara, K., Mohammadi, S., Sani, N. A., & Babji, A. S. (2017). Identification of two novel antioxidant peptides from edible bird's nest (*Aerodramus fuciphagus*) protein hydrolysates. *Food & Function*, *8*(5), 2046–2052. https://doi.org/10.1039/c6fo01615d

Giampietro, O., Chiara Masoni, M., Matteucci, E., Giampietro, C., Giordani, S., & Consani, Ferdinando De Negri, C. (2018). Clinical efficacy of a nutraceutical approach for the management of dyslipidemia in metabolic disorders: A one-year treatment with armolipid plus. *Journal of Cardiology and Therapy*, *5*(1), 701–706. https://doi.org/10.17554/j.issn.2309-6861.2018.05.141

Giannetto, A., Esposito, E., Lanza, M., Oliva, S., Riolo, K., Di Pietro, S., Abbate, J. M., Briguglio, G., Cassata, G., Cicero, L., & Macrì, F. (2020). Protein Hydrolysates from Anchovy (*Engraulis encrasicolus*) Waste: *In Vitro* and *In Vivo* Biological Activities. *Marine Drugs*, *18*(2), 86. https://doi.org/10.3390/md18020086

Global Burden of Disease Collaborative Network. Global Burden of Disease Study 2019 (GBD 2019) Results. Seattle, WA: Institute for Health Metrics and Evaluation (IHME); 2020. Available at: http://ghdx.healthdata.org/gbdresults-tool.

Goldstein, J.L., & Brown, M.S. (2015). A century of cholesterol and coronaries: From plaques to genes to statins. *Cell*, *161*(1), 161–172. https://doi.org/10.1016/j.cell.2015.01.036

Gradinaru, D., Borsa, C., Lonescu, C., and Prada, G. I. (2015). Oxidized LDL and NO synthesis—Biomarkers of endothelial dysfunction and ageing. *Mechanisms of Ageing and Development, 151*: 101–113. https://doi.org/10.1016/j.mad.2015.03.003

Grancieri, M., Martino, H. S. D., & Gonzalez de Mejia, E. (2019). Chia (*Salvia hispanica* L.) seed total protein and protein fractions digests reduce biomarkers of inflammation and atherosclerosis in macrophages *in vitro*. *Molecular Nutrition & Food Research*, *63*(19), 1900021. https://doi.org/10.1002/mnfr.201900021

Gu, W., Geng, C., Xue, W., Wu, Q., Chao, J., Xu, F., Sun, H., Jiang, L., Han, Y. and Zhang, S. (2015). Characterization and function of the 3-hydroxy-3-methylglutaryl-CoA reductase gene in *Alisma orientale* (Sam.) Juz. and its relationship with protostane triterpene production. *Plant Physiology* *and Biochemistry, 97*, 378–389. https://doi.org/10.1016/j.plaphy.2015.10.031

Guha, S., & Majumder, K. (2018). Structural-features of food-derived bioactive peptides with anti-inflammatory activity: A brief review. *Journal of Food Biochemistry*, *43*(1), e12531. https://doi.org/10.1111/jfbc.12531

Gunathilake, D. M. C. C., Senanayaka, D. P., Adiletta, G., & Senadeera, W. (2018). Drying of Agricultural Crops. *Advances in Agricultural Machinery and Technologies*, 331–365. https://doi.org/10.1201/9781351132398-14

Guo, C.-T., Takahashi, T., Bukawa, W., Takahashi, N., Yagi, H., Kato, K., Hidari, K. I.-P. . J., Miyamoto, D., Suzuki, T., & Suzuki, Y. (2006). Edible bird's nest extract inhibits influenza virus infection. *Antiviral Research, 70*(3), 140–146. https://doi.org/10.1016/j.antiviral.2006.02.005

Guo, S., Tian, H., Dong, R., Yang, N., Zhang, Y., Yao, S., Li, Y., Zhou, Y., Si, Y., & Qin, S. (2016). Exogenous supplement of *N*-acetylneuraminic acid ameliorates atherosclerosis in apolipoprotein E-deficient mice. *Atherosclerosis*, *251*, 183–191. https://doi.org/10.1016/j.atherosclerosis.2016.05.032

Gwon, M.-H., Im, Y.-S., Seo, A.-R., Kim, K. Y., Moon, H.-R., & Yun, J.-M. (2020). Phenethyl isothiocyanate protects against high fat/cholesterol diet-induced obesity and atherosclerosis in c57bl/6 mice. *Nutrients, 12*(12), 3657. https://doi.org/10.3390/nu12123657

Hadwan, M. H. (2018). Simple spectrophotometric assay for measuring catalase activity in biological tissues. *BMC Biochemistry*, *19*(1). https://doi.org/10.1186/s12858-018-0097-5

Hafidz, K. A., Puspitasari, N., A, A., Yanuar, A., Artha, Y., & Mun'im, A. (2017). HMG-CoA reductase inhibitory activity of *Gnetum gnemon* seed extract and identification of potential inhibitors for lowering cholesterol level. *Journal of Young Pharmacists*, *9*(4), 559–565. https://doi.org/10.5530/jyp.2017.9.107

Haghani, A., Mehrbod, P., Safi, N., Aminuddin, N. A., Bahadoran, A., Omar, A. R., & Ideris, A. (2016). *In vitro* and *in vivo* mechanism of immunomodulatory and antiviral activity of edible bird's nest (EBN) against influenza A virus (IAV) infection. *Journal of Ethnopharmacology*, *185*, 327–340. https://doi.org/10.1016/j.jep.2016.03.020

Halimi, N. M., Kasim, Z. M., & Babji, A. S. (2014). Nutritional composition and solubility of edible bird nest (*Aerodramus fuchiphagus*). *AIP Conference Proceedings*. https://doi.org/10.1063/1.4895243

Hansson, G. K., & Hermansson, A. (2011). The immune system in atherosclerosis. *Nature Immunology*, *12*(3), 204–212. https://doi.org/10.1038/ni.2001

Hassanein, E. H. M., Sayed, A. M., Hussein, O. E., & Mahmoud, A. M. (2020). Coumarins as modulators of the Keap1/Nrf2/ARE signaling pathway. *Oxidative Medicine and Cellular Longevity*, *2020*, 1–25. https://doi.org/10.1155/2020/1675957

He, Q. (2011). Metabonomics and its role in amino acid nutrition research. *Frontiers in Bioscience, 16*(1), 2451. https://doi.org/10.2741/3865

Heo, S. H., Cho, C.-H., Kim, H. O., Jo, Y. H., Yoon, K.-S., Lee, J. H., Park, J.-C., Park, K. C., Ahn, T.-B., Chung, K. C., Yoon, S.-S., & Chang, D.-I. (2011). Plaque rupture is a determinant of vascular events in carotid artery atherosclerotic disease: involvement of matrix metalloproteinases 2 and 9. *Journal of Clinical Neurology*, *7*(2), 69. https://doi.org/10.3988/jcn.2011.7.2.69

Ho, C.-M., Ho, S.-L., Jeng, Y.-M., Lai, Y.-S., Chen, Y.-H., Lu, S.-C., Chen, H.-L., Chang, P.-Y., Hu, R.-H., & Lee, P.-H. (2019). Accumulation of free cholesterol and oxidized low-density lipoprotein is associated with portal inflammation and fibrosis in nonalcoholic fatty liver disease. *Journal of Inflammation*, *16*(1). https://doi.org/10.1186/s12950-019-0211-5

Hognestad, A., Aukrust, P., Wergeland, R., Stokke, O., Gullestad, L., Semb, A., Holm, Andreassen, A. K., & Kjekshus, J. K. (2004). Effects of conventional and aggressive statin treatment on markers of endothelial function and inflammation. *Clinical Cardiology, 27*(4), 199–203. https://doi.org/10.1002/clc.4960270405

Horwitz, W. 2000. Official Methods of Analysis of AOAC International (Oma). Education, Gaithersburg.

Hosoyamada, K., Uto, H., Imamura, Y., Hiramine, Y., Toyokura, E., Hidaka, Y., Kuwahara, T., Kusano, K., Saito, K., Oketani, M., Ido, A., & Tsubouchi, H. (2012). Fatty liver in men is associated with high serum levels of small, dense low-density lipoprotein cholesterol. *Diabetology & Metabolic Syndrome*, *4*(1), 34. https://doi.org/10.1186/1758-5996-4-34

Hou, Z., Imam, M. U., Ismail, M., Mahmud, R., Ideris, A., & Ooi, D. J. (2015). Nutrigenomic effects of edible bird's nest on insulin signaling in ovariectomized rats. *Drug Design, Development and Therapy*, 4115. https://doi.org/10.2147/dddt.s80743

Hou, Z., He, P., Imam, M. U., Qi, J., Tang, S., Song, C., & Ismail, M. (2017). Edible bird's nest prevents menopause-related memory and cognitive decline in rats via increased hippocampal sirtuin-1 expression. *Oxidative Medicine and Cellular Longevity*, *2017*, 1–8. https://doi.org/10.1155/2017/7205082

Hou, P., Hu, S., Wang, J., Yang, Z., Yin, J., Zhou, G., & Guo, S. (2019). Exogenous supplement of *N*-acetylneuraminic acid improves macrophage reverse cholesterol transport in apolipoprotein E-deficient mice. *Lipids in Health and Disease, 18*(1). https://doi.org/10.1186/s12944-019-0971-1

Hu, Y.-W., Zheng, L., & Wang, Q. (2010). Regulation of cholesterol homeostasis by liver X receptors. *Clinica Chimica Acta*, *411*(9-10), 617–625. https://doi.org/10.1016/j.cca.2009.12.027

Hu, Y.-W., Ma, X., Huang, J.-L., Mao, X.-R., Yang, J.-Y., Zhao, J.-Y., Li, S.-F., Qiu, Y.-R., Yang, J., Zheng, L., & Wang, Q. (2013). Dihydrocapsaicin attenuates plaque formation through a PPARγ/LXRα pathway in ApoE−/− mice fed a high-fat/high-cholesterol diet. *PLoS ONE*, *8*(6), e66876. https://doi.org/10.1371/journal.pone.0066876

Hu, Q., Li, G., Yao, H., He, S., Li, H., Liu, S., Wu, Y., & Lai, X. (2016). Edible bird's nest enhances antioxidant capacity and increases lifespan in Drosophila Melanogaster. *Cellular and Molecular Biology*, *62*(4). https://doi.org/10.14715/cmb/2016.62.4.20

Huang, W.-C., Lin, T.-W., Chiou, K.-R., Cheng, C.-C., Kuo, F.-Y., Chiang, C.-H., Yang, J.-S., Lin, K.-L., Hsiao, S.-H., Yeh, T.-C., Mar, G.-Y., Hsiao, H.-C., Lin, S.-L., Chiou, C.-W., & Liu, C.-P. (2013). The effect of intensified low density lipoprotein cholesterol reduction on recurrent myocardial infarction and cardiovascular mortality. *Acta Cardiologica Sinica*, *29*(5), 404–412. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4804789/

Huang, S., Zhao, L., Chen, Q., Qin, Z., Zhou, J., Qiu, Y., Zhang, Y., & Ma, M. (2018). Physicochemical characteristics of edible bird's nest proteins and their cooking processing properties. *International Journal of Food Engineering*, *14*(3). https://doi.org/10.1515/ijfe-2017-0152

Huda, M. Z. N., Zuki, A. B. Z., Azhar, K., Goh, Y. M., Suhaimi, H., Hazmi, A. J. A., et al. (2008). Proximate, elemental and fatty acid analysis of pre-processed edible birds' nest (*Aerodramus fuciphagus*): A comparison between regions and type of nest. *Journal of Food Technology, 6*(1), 39-44.

Huff, T., Boyd, B., & Ishwarlal Jialal. (2021). Physiology, Cholesterol. StatPearls Publishing. https://www.ncbi.nlm.nih.gov/books/NBK470561/?report=classic

Hui, J., Aulakh, G. K., Unniappan, S., & Singh, B. (2021). Loss of Nucleobindin-2/Nesfatin-1 increases lipopolysaccharide-induced murine acute lung inflammation. *Cell and Tissue Research*, *385*(1), 87–103. https://doi.org/10.1007/s00441-021-03435-6

Hun, L.T., Wani, W.A., Tan, E.T.T., Adnan, N.A., Ling, Y.L. & Abdul Aziz, R. (2015). Investigations into the physicochemical, biochemical, and antibacterial properties of edible bird's nest. *Journal of Chemical and Pharmaceutical Research, 7*, 228–247.

Hun, L. T., Wani, W. A., Poh, H. Y., Baig, U., Ti Tjih, E. T., Nashiruddin, N. I., Ling, Y. E., & Aziz, R. A. (2016). Gel electrophoretic and liquid chromatographic methods for the identification and authentication of cave and house edible bird's nests from common adulterants. *Analytical Methods*, *8*(3), 526–536. https://doi.org/10.1039/c5ay02170g

Hwang, E., Park, S. W., & Yang, J.-E. (2020). Anti-aging, anti-inflammatory, and wound-healing activities of edible bird's nest in human skin keratinocytes and fibroblasts. *Pharmacognosy Magazine, 16*(69), 336–342. https://doi.org/10.4103/pm.pm_326_19

Hwang, K.A., Hwang, Y.J. and Song, J. (2016). Antioxidant activities and oxidative stress inhibitory effects of ethanol extracts from *Cornus officinalis* on RAW 264.7 cells. *BMC Complementary and Alternative Medicine, 16*:196. doi:10.1186/s12906-016-1172-3

Hwang, J.-T., Choi, E., Choi, H.-K., Park, J.-H., & Chung, M.-Y. (2021). The cholesterol-lowering effect of *Capsella Bursa-Pastoris* is mediated via SREBP2 and HNF-1α-regulated PCSK9 Inhibition in obese mice and HepG2 cells. *Foods*, *10*(2), 408. https://doi.org/10.3390/foods10020408

Ibrahim, A., Shafie, N. H., Mohd Esa, N., Shafie, S. R., Bahari, H., & Abdullah, M. A. (2020). *Mikania micrantha* extract inhibits HMG-CoA reductase and ACAT2 and ameliorates hypercholesterolemia and lipid peroxidation in high cholesterol-fed rats. *Nutrients*, *12*(10), 3077. https://doi.org/10.3390/nu12103077

Ibrahim, M., Ahmed, I. A., Mikail, M. A., Ishola, A. A., Draman, S., Isa, M. L. M., & Yusof, A. M. (2017). *Baccaurea angulata* fruit juice reduces atherosclerotic lesions in diet-induced Hypercholesterolemic rabbits. *Lipids in Health and Disease*, *16*(1). https://doi.org/10.1186/s12944-017-0526-2

Idris, O., Wintola, O., & Afolayan, A. (2019). Comparison of the proximate composition, vitamins (ascorbic acid, α-tocopherol and retinol), anti-nutrients (phytate and oxalate) and the GC-MS analysis of the essential oil of the root and leaf of *Rumex crispus L*. *Plants*, *8*(3), 51. https://doi.org/10.3390/plants8030051

Iijima, R., Takahashi, H., Namme, R., Ikegami, S., & Yamazaki, M. (2004). Novel biological function of sialic acid (*N* -acetylneuraminic acid) as a hydrogen peroxide scavenger. *FEBS Letters*, *561*(1-3), 163–166. https://doi.org/10.1016/s0014-5793(04)00164-4

Imam, M. U., Musa, S. N. A., Azmi, N. H., & Ismail, M. (2012). Effects of white rice, brown rice and germinated brown rice on antioxidant status of type 2 diabetic rats. *International Journal of Molecular Sciences*, *13*(12), 12952–12969. https://doi.org/10.3390/ijms131012952

Institute for Public Health. *National Health and Morbidity Survey 2011 (NHMS 2011). Vol. II: Non-Communicable Diseases*. Kuala Lumpur, Ministry of Health, Malaysia.

Institute for Public Health. *National Health and Morbidity Survey 2015 (NHMS 2015). Vol. II: Non-Communicable Diseases, Risk Factors and Other Health Problems.* Kuala Lumpur, Ministry of Health, Malaysia.

Institute of Public Health (IPH) 2017. Malaysian Burden of Disease and Injury Study 2009- 2014.

Institute for Public Health. National Health and Morbidity Survey (NHMS 2019). Vol. I: *Non-Communicable Diseases, Risk Factors and Other Health Problems*. Kuala Lumpur: Ministry of Health Malaysia.

Iqbal, D., Khan, M. S., Khan, A., Khan, Mohd. S., Ahmad, S., Srivastava, A. K., & Bagga, P. (2014). *In vitro* screening for β-Hydroxy-β-methylglutaryl-CoA reductase inhibitory and antioxidant activity of sequentially extracted fractions of *Ficus palmata* forsk. *BioMed Research International*, *2014*, 1–10. https://doi.org/10.1155/2014/762620

Islam, M. M., Hlushchenko, I., & Pfisterer, S. G. (2022). Low-density lipoprotein internalization, degradation and receptor recycling along membrane contact sites. *Frontiers in Cell and Developmental Biology*, *10*. https://doi.org/10.3389/fcell.2022.826379

Ismail, M. A. H., Anuar Bahari, E., Ibrahim, F. S., Dasiman, R., & Amom, Z. (2016). Effects of *Gynura procumbens* extract on liver function test of hypercholesterolemia induced rabbits. *Jurnal Teknologi, 78*(6–7). https://doi.org/10.11113/jt.v78.9083

Ivanova, E. A., & Orekhov, A. N. (2016). Cellular model of atherogenesis based on pluripotent vascular wall pericytes. *Stem Cells International*, *2016*, 1–7. https://doi.org/10.1155/2016/7321404

Iwakiri, Y., & Kim, M. Y. (2015). Nitric oxide in liver diseases. *Trends in Pharmacological Sciences*, *36*(8), 524–536. https://doi.org/10.1016/j.tips.2015.05.001

Jaden. (2017, June 19). *Chinese Bird's Nest Soup Recipe*. Steamy Kitchen Recipes Giveaways. https://steamykitchen.com/44260-chinese-birds-nest-soup-recipe.html

Janicko, M., Drazilova, S., Pella, D., Fedacko, J., & Jarcuska, P. (2016). Pleiotropic effects of statins in the diseases of the liver. *World Journal of Gastroenterology*, *22*(27), 6201. https://doi.org/10.3748/wjg.v22.i27.6201

Jensen, I.-J., Walquist, M., Liaset, B., Elvevoll, E. O., & Eilertsen, K.-E. (2016). Dietary intake of cod and scallop reduces atherosclerotic burden in female apolipoprotein E-deficient mice fed a Western-type high fat diet for 13 weeks. *Nutrition & Metabolism*, 13(1). https://doi.org/10.1186/s12986-016-0068-z

Jeong, S.-J., Lee, M.-N., & Oh, G. T. (2017). The role of macrophage lipophagy in reverse cholesterol transport. *Endocrinology and Metabolism*, *32*(1), 41. https://doi.org/10.3803/enm.2017.32.1.41

Jia, Q., Cao, H., Shen, D., Li, S., Yan, L., Chen, C., Xing, S., & Dou, F. (2019). Quercetin protects against atherosclerosis by regulating the expression of PCSK9, CD36, PPARγ, LXRα and ABCA1. *International Journal of Molecular Medicine*, 44, 893-902. https://doi.org/10.3892/ijmm.2019.4263

Jiang, S.-Y., Li, H., Tang, J.-J., Wang, J., Luo, J., Liu, B., Wang, J.-K., Shi, X.-J., Cui, H.-W., Tang, J., Yang, F., Qi, W., Qiu, W.-W., & Song, B.-L. (2018). Discovery of a potent HMG-CoA reductase degrader that eliminates statin-induced reductase accumulation and lowers cholesterol. *Nature Communications*, *9*(1). https://doi.org/10.1038/s41467-018-07590-3

Jin, M., Yang, F., Yang, I., Yin, Y., Luo, J. J., Wang, H., & Yang, X.-F. (2012). Uric acid, hyperuricemia and vascular diseases. *Frontiers in Bioscience*, *17*(2), 656–669. https://doi.org/10.2741/3950

Juan, C. A., Pérez de la Lastra, J. M., Plou, F. J., & Pérez-Lebeña, E. (2021). The chemistry of reactive oxygen species (ROS) revisited: Outlining their role in biological macromolecules (DNA, lipids and proteins) and induced pathologies. *International Journal of Molecular Sciences*, *22*(9), 4642. https://doi.org/10.3390/ijms22094642

Jung, M. H., Seong, P. N., Kim, M. H., Myong, N.-H., & Chang, M.-J. (2013). Effect of green tea extract microencapsulation on hypertriglyceridemia and cardiovascular tissues in high fructose-fed rats. *Nutrition Research and Practice*, *7*(5), 366. https://doi.org/10.4162/nrp.2013.7.5.366

Kamp, D.W., Shacter, E. and Weitzman, S.A. (2011). Chronic inflammation and cancer: The role of the mitochondria. *Oncology (Williston Park)*, *25*(5), 400–410.

Kaplan, D. E., Serper, M. A., Mehta, R., Fox, R., John, B., Aytaman, A., Baytarian, M., Hunt, K., Albrecht, J., Njei, B., & Taddei, T. H. (2019). Effects of hypercholesterolemia and statin exposure on survival in a large national cohort of patients with cirrhosis. *Gastroenterology, 156*(6), 1693-1706.e12. https://doi.org/10.1053/j.gastro.2019.01.026

Kar, N. S., Ashraf, M. Z., Valiyaveettil, M., & Podrez, E. A. (2008). Mapping and characterization of the binding site for specific oxidized phospholipids and oxidized low density lipoprotein of scavenger receptor CD36. *Journal of Biological Chemistry*, *283*(13), 8765–8771. https://doi.org/10.1074/jbc.m709195200

Kawanishi, K., Coker, J. K., Grunddal, K. V., Dhar, C., Hsiao, J., Zengler, K., Varki, N., Varki, A., & Gordts, P. L. S. M. (2021). Dietary Neu5Ac intervention protects against atherosclerosis associated with human-like Neu5Gc loss—brief report. *Arteriosclerosis, Thrombosis, and Vascular Biology*, *41*(11), 2730–2739. https://doi.org/10.1161/atvbaha.120.315280

Kelebek, H., & Selli, S. (2011). Evaluation of chemical constituents and antioxidant activity of sweet cherry (*Prunus avium L*.) cultivars. *International Journal of Food Science & Technology*, *46*(12), 2530–2537. https://doi.org/10.1111/j.1365-2621.2011.02777.x

Kelemen, K., & Szilágyi, T. (2021). New Approach for Untangling the Role of Uncommon Calcium-Binding Proteins in the Central Nervous System. *Brain Sciences*, *11*(5), 634. https://doi.org/10.3390/brainsci11050634

Kew, P.E., Wong, S.F., Lim, P.K. and Mak, J.W. (2014). Structural analysis of raw and commercial farm edible bird nests. *Tropical Biomedicine, 31*, 63–76.

Khalid, S.K.A., Rashed, A.A., Aziz, S.A. and Ahmad, H. (2019). Effects of sialic acid from edible bird nest on cell viability associated with brain cognitive performance in mice. *World Journal of Traditional Chinese Medicine, 5*(4), 214-219. doi: 10.4103/wjtcm.wjtcm_22_19.

Khan, M. M., Kim, Y. K., Bilkis, T., Suh, J.-W., Lee, D. Y., & Yoo, J. C. (2020). Reduction of oxidative stress through activating the Nrf2 mediated HO-1 antioxidant efficacy signaling pathway by MS15, an antimicrobial peptide from *Bacillus velezensis*. *Antioxidants*, *9*(10), 934. https://doi.org/10.3390/antiox9100934

Khodadadi, S., Zabihi, N. A., Niazmand, S., Abbasnezhad, A., Mahmoudabady, M., & Rezaee, S. A. (2018). *Teucrium polium* improves endothelial dysfunction by regulating eNOS and VCAM-1 genes expression and vasoreactivity in diabetic rat aorta. *Biomedicine & Pharmacotherapy*, *103*, 1526–1530. https://doi.org/10.1016/j.biopha.2018.04.158

Khosravi, M., Poursaleh, A., Ghasempour, G., Farhad, S., & Najafi, M. (2019). The effects of oxidative stress on the development of atherosclerosis. *Biological Chemistry*, *400*(6), 711–732. https://doi.org/10.1515/hsz-2018-0397

Khushairay, E. S. I., Ayub, M. K., & Babji, A. S. (2014). Effect of enzymatic hydrolysis of pancreatin and alcalase enzyme on some properties of edible bird's nest hydrolysate. *AIP Conference Proceedings*. https://doi.org/10.1063/1.4895235

Kidani, Y., & Bensinger, S. J. (2012). Liver X receptor and peroxisome proliferator-activated receptor as integrators of lipid homeostasis and immunity. *Immunological Reviews*, *249*(1), 72–83. https://doi.org/10.1111/j.1600-065x.2012.01153.x

Kim, E. J., Kim, B., Seo, H. S., Lee, Y. J., Kim, H. H., Son, H.-H., & Choi, M. H. (2014). Cholesterol-induced non-alcoholic fatty liver disease and atherosclerosis aggravated by systemic inflammation. *PLoS ONE*, *9*(6), e97841. https://doi.org/10.1371/journal.pone.0097841

Kim, J., & Yim, D.-G. (2016). Assessment of the microbial level for livestock products in retail meat shops implementing HACCP system. *Korean Journal for Food Science of Animal Resources*, *36*(5), 588–594. https://doi.org/10.5851/kosfa.2016.36.5.594

Kim, O.-K., Kim, D., Lee, M., Park, S.-H., Yamada, W., Eun, S., & Lee, J. (2021). Standardized edible bird's nest extract prevents UVB irradiation-mediated oxidative stress and photoaging in the skin. *Antioxidants*, *10*(9), 1452. https://doi.org/10.3390/antiox10091452

Kirii, H., Niwa, T., Yamada, Y., Wada, H., Saito, K., Iwakura, Y., Asano, M., Moriwaki, H., & Seishima, M. (2003). Lack of interleukin-1β decreases the severity of atherosclerosis in ApoE-deficient mice. *Arteriosclerosis, Thrombosis, and Vascular Biology*, *23*(4), 656–660. https://doi.org/10.1161/01.atv.0000064374.15232.c3

Knust, K. S., & Leung, A. M. (2017). Iodine. *Molecular, Genetic, and Nutritional Aspects of Major and Trace Minerals*, 133–141. https://doi.org/10.1016/b978-0-12-802168-2.00011-7

Kolluru, G. K., Bir, S. C., & Kevil, C. G. (2012). Endothelial dysfunction and diabetes: Effects on angiogenesis, vascular remodeling, and wound healing. *International Journal of Vascular Medicine*, *2012*, 1–30. https://doi.org/10.1155/2012/918267

Kongo-Dia-, J. U., Nsor-Atind, J., and Zhang, H. (2011). Hypocholesterolemic activity and characterization of protein hydrolysates from defatted corn protein. *Asian Journal of Biochemistry,* *6*(6), 439–449. https://doi.org/10.3923/ajb.2011.439.449

Konior, A., Schramm, A., Czesnikiewicz-Guzik, M., & Guzik, T. J. (2021). NADPH oxidases in vascular pathology. *Antioxidants & Redox Signaling*: *Vascular NADPH oxidases*, 20(17). https://dx.doi.org/10.1089%2Fars.2013.5607

Kozakova, M., Palombo, C., Paterni Eng, M., Dekker, J., Flyvbjerg, A., Mitrakou, A., Gastaldelli, A., & Ferrannini, E. (2012). Fatty liver index, gamma-glutamyltransferase, and early carotid plaques. *Hepatology*, *55*(5), 1406–1415. https://doi.org/10.1002/hep.25555

Króliczewska, B., Miśta, D., Ziarnik, A., Żuk, M., Szopa, J., Pecka-Kiełb, E., Zawadzki, W., & Króliczewski, J. (2018). The effects of seed from Linum usitatissimum cultivar with increased phenylpropanoid compounds and hydrolysable tannin in a high cholesterol-fed rabbit. *Lipids in Health and Disease*, *17*(1). https://doi.org/10.1186/s12944-018-0726-4

Kryczka, K. E., Kruk, M., Demkow, M., & Lubiszewska, B. (2021). Fibrinogen and a triad of thrombosis, inflammation, and the renin-angiotensin system in premature coronary artery disease in women: a new insight into sex-related differences in the pathogenesis of the disease. *Biomolecules*, *11*(7), 1036. https://doi.org/10.3390/biom11071036

Kumari, A., Kristensen, K. K., Ploug, M., & Winther, A.-M. L. (2021). The importance of lipoprotein lipase regulation in atherosclerosis. *Biomedicines*, *9*(7), 782. https://doi.org/10.3390/biomedicines9070782

Kurtel, H., Rodrigues, S. F., Yilmaz, C. E., Yildirim, A., & Granger, D. N. (2013). Impaired vasomotor function induced by the combination of hypertension and hypercholesterolemia. *Journal of the American Society of Hypertension*, *7*(1), 14–23. https://doi.org/10.1016/j.jash.2012.11.005

Laemmli, U.K. (1970). Cleavage of structural proteins during the assembly of the head of bacteriophage T4. *Nature*, *227*, 680–685.

Lai, X.-F., Qin, H.-D., Guo, L.-L., Luo, Z.-G., Chang, J., & Qin, C.-C. (2014). Hypercholesterolemia increases the production of leukotriene B4 in neutrophils by enhancing the nuclear localization of 5-lipoxygenase. *Cellular Physiology and Biochemistry*, *34*(5), 1723–1732. https://doi.org/10.1159/000366373

Lai, P., Cao, X., Xu, Q., Liu, Y., Li, R., Zhang, J., & Zhang, M. (2020). *Ganoderma lucidum* spore ethanol extract attenuates atherosclerosis by regulating lipid metabolism via upregulation of liver X receptor alpha. *Pharmaceutical Biology*, *58*(1), 760–770. https://doi.org/10.1080/13880209.2020.1798471

Lapenna, D., de Gioia, S., Ciofani, G., Mezzetti, A., Ucchino, S., Calafiore, A. M., Napolitano, A. M., Di Ilio, C., & Cuccurullo, F. (1998). glutathione-related antioxidant defenses in human atherosclerotic plaques. *Circulation*, *97*(19), 1930–1934. https://doi.org/10.1161/01.cir.97.19.1930

Lappalainen, J., Yeung, N., Nguyen, S. D., Jauhiainen, M., Kovanen, P. T., & Lee-Rueckert, M. (2021). Cholesterol loading suppresses the atheroinflammatory gene polarization of human macrophages induced by colony stimulating factors. *Scientific Reports*, *11*(1), 4923. https://doi.org/10.1038/s41598-021-84249-y

Lara-Guzmán, O. J., Gil-Izquierdo, Á., Medina, S., Osorio, E., Álvarez-Quintero, R., Zuluaga, N., Oger, C., Galano, J.-M., Durand, T., & Muñoz-Durango, K. (2018). Oxidized LDL triggers changes in oxidative stress and inflammatory biomarkers in human macrophages. *Redox Biology*, *15*, 1–11. https://doi.org/10.1016/j.redox.2017.11.017

Larson, D., Hayden, J., & Hari Nair. (2017). *Clinical chemistry: fundamentals and laboratory techniques*. Elsevier/Saunders.

Lavin, B., Phinikaridou, A., Lorrio, S., Zaragoza, C., & Botnar, R. M. (2015). Monitoring vascular permeability and remodeling after endothelial injury in a murine model using a magnetic resonance albumin-binding contrast agent. *Circulation: Cardiovascular Imaging*, *8*(4). https://doi.org/10.1161/circimaging.114.002417

Lee, B.-J., Tseng, Y.-F., Yen, C.-H., & Lin, P.-T. (2013). Effects of coenzyme Q10 supplementation (300 mg/day) on antioxidation and anti-inflammation in coronary artery disease patients during statins therapy: a randomized, placebo-controlled trial. *Nutrition Journal*, *12*(1). https://doi.org/10.1186/1475-2891-12-142

Lee, L.-C., Wei, L., Huang, W.-C., Hsu, Y.-J., Chen, Y.-M., & Huang, C.-C. (2015a). Hypolipidemic effect of tomato juice in hamsters in high cholesterol diet-induced hyperlipidemia. *Nutrients*, *7*(12), 10525–10537. https://doi.org/10.3390/nu7125552

Lee, T. H., Waseem, A. W., Eddie, T. T. T., Nur Ardawati, A., Yong, L. L., & Ramlan, A. A. (2015b). Investigations into the physicochemical, biochemical and antibacterial properties of Edible Bird's Nest. *Journal of Chemical and Pharmaceutical Research*, *7*(7), 228–247.

Lee, S., Lee, M.-S., Chang, E., Lee, Y., Lee, J., Kim, J., Kim, C.-T., Kim, I.-H., & Kim, Y. (2020). Mulberry fruit extract promotes serum hdl-cholesterol levels and suppresses hepatic microRNA-33 expression in rats fed high cholesterol/cholic acid diet. *Nutrients*, *12*(5), 1499. https://doi.org/10.3390/nu12051499

Lee, T. H., Wani, W. A., Lee, C. H., Cheng, K. K., Shreaz, S., Wong, S., Hamdan, N., & Azmi, N. A. (2021). Edible Bird's Nest: The functional values of the prized animal-based bioproduct from Southeast Asia–A review. *Frontiers in Pharmacology*, *12*. https://doi.org/10.3389/fphar.2021.626233

Lefere, S., Van de Velde, F., Hoorens, A., Raevens, S., Van Campenhout, S., Vandierendonck, A., Neyt, S., Vandeghinste, B., Vanhove, C., Debbaut, C., Verhelst, X., Van Dorpe, J., Van Steenkiste, C., Casteleyn, C., Lapauw, B., Van Vlierberghe, H., Geerts, A., & Devisscher, L. (2019). Angiopoietin-2 promotes pathological angiogenesis and is a therapeutic target in murine nonalcoholic fatty liver disease. *Hepatology*, *69*(3), 1087–1104. https://doi.org/10.1002/hep.30294

Lei, X. G., Zhu, J.-H., Cheng, W.-H., Bao, Y., Ho, Y.-S., Reddi, A. R., Holmgren, A., & Arnér, E. S. J. (2016). Paradoxical roles of antioxidant enzymes: basic mechanisms and health implications. *Physiological Reviews*, *96*(1), 307–364. https://doi.org/10.1152/physrev.00010.2014

Levy, E., Spahis, S., Sinnett, D., Peretti, N., Maupas-Schwalm, F., Delvin, E., Lambert, M., & Lavoie, M.-A. (2007). Intestinal cholesterol transport proteins: an update and beyond. *Current Opinion in Lipidology*, *18*(3), 310–318. https://doi.org/10.1097/mol.0b013e32813fa2e2

Li, R., Oteiza, A., Sørensen, K. K., McCourt, P., Olsen, R., Smedsrød, B., & Svistounov, D. (2011). Role of liver sinusoidal endothelial cells and stabilins in elimination of oxidized low-density lipoproteins. *American Journal of Physiology-Gastrointestinal and Liver Physiology*, *300*(1), G71–G81. https://doi.org/10.1152/ajpgi.00215.2010

Li, H., Wang, Z., Liang, M., Cai, L., & Yang, L. (2019). Methionine augments antioxidant activity of rice protein during gastrointestinal digestion. *International Journal of Molecular Sciences*, *20*(4), 868. https://doi.org/10.3390/ijms20040868

Liang, X., Ye, M., Tao, M., Zheng, D., Cai, R., Zhu, Y., Jin, J., & He, Q. (2020). The association between dyslipidemia and the incidence of chronic kidney disease in the general Zhejiang population: A retrospective study. *BMC Nephrology, 21*(1): 252. https://doi.org/10.1186/s12882-020-01907-5

Lim, C. (2007). *Make millions from swiftlet farming: A definitive guide*. True Wealth (Chapters 1 & 6).

Lin, Y., Jiang, M., Chen,W., Zhao, T. and Wei, Y. (2019). Cancer and ER stress: Mutual crosstalk between autophagy, oxidative stress and inflammatory response. *Biomedicine & Pharmacotherapy, 118*, 109249.

Ling, J. W. A., Chang, L. S., Babji, A. S., & Lim, S. J. (2020). Recovery of value-added glycopeptides from edible bird's nest (EBN) co-products: Enzymatic hydrolysis, physicochemical characteristics and bioactivity. *Journal of the Science of Food and Agriculture*, *100*(13), 4714–4722. https://doi.org/10.1002/jsfa.10530

Ling, A. J. W., Chang, L. S., Babji, A. S., Latip, J., Koketsu, M., & Lim, S. J. (2022). Review of sialic acid's biochemistry, sources, extraction and functions with special reference to edible bird's nest. *Food Chemistry*, *367*, 130755. https://doi.org/10.1016/j.foodchem.2021.130755

Lingappan, K. (2018). NF-κB in oxidative stress. *Current Opinion in Toxicology*, *7*, 81–86. https://doi.org/10.1016/j.cotox.2017.11.002

Linton, M. F., Yancey, P. G., Davies, S. S., Jerome, W. G., Linton, E. F., Song, W. L., Doran, A. C., & Vickers, K. C. (2019). The role of lipids and lipoproteins in atherosclerosis. Nih.gov. https://www.ncbi.nlm.nih.gov/books/NBK343489/

Lioudakis, E., & Lucitt, M. (2021). Statin disruption of cholesterol metabolism and altered innate inflammatory responses in atherosclerosis. *Immunometabolism*, *3*(3), e210023. https://doi.org/10.20900/immunometab20210023

Liu, M., Yu, Y., Jiang, H., Zhang, L., Zhang, P., Yu, P., Jia, J., Chen, R., Zou, Y., & Ge, J. (2013). Simvastatin suppresses vascular inflammation and atherosclerosis in ApoE−/− mice by downregulating the HMGB1-RAGE axis. *Acta Pharmacologica Sinica*, *34*(6), 830–836. https://doi.org/10.1038/aps.2013.8

Liu, X.-F., Zheng, C.-G., Shi, H.-G., Tang, G.-S., Wang, W.-Y., Zhou, J., & Dong, L.-W. (2015). Ethanol extract from *Portulaca oleracea L*. attenuated acetaminophen-induced mice liver injury. *American Journal of Translational Research*, *7*(2), 309–318.

Liu, T., Zhang, L., Joo, D., & Sun, S.-C. (2017a). NF-κB signaling in inflammation. *Signal Transduction and Targeted Therapy*, *2*. https://doi.org/10.1038/sigtrans.2017.23

Liu, M., Chung, S., Shelness, G. S., & Parks, J. S. (2017b). Hepatic ABCA1 deficiency is associated with delayed apolipoprotein B secretory trafficking and augmented VLDL triglyceride secretion. *Biochimica et Biophysica Acta (BBA) - Molecular and Cell Biology of Lipids*, *1862*(10), 1035–1043. https://doi.org/10.1016/j.bbalip.2017.07.001

Looi, Q. H., & Omar, A. R. (2016). Swiftlets and edible bird's nest industry in asia. *Pertanika Journal of Scholarly Research Reviews, 2*(2), 32–48. https://doi.org/eISSN: 2462-2028

Lozhkin, A., Vendrov, A. E., Pan, H., Wickline, S. A., Madamanchi, N. R., & Runge, M. S. (2017). NADPH oxidase 4 regulates vascular inflammation in aging and atherosclerosis. *Journal of Molecular and Cellular Cardiology*, *102*, 10–21. https://doi.org/10.1016/j.yjmcc.2016.12.004

Lu, R., Yuan, T., Wang, Y., Zhang, T., Yuan, Y., Wu, D., Zhou, M., He, Z., Lu, Y., Chen, Y., Fan, J., Liang, J. and Cheng, Y. (2018). Spontaneous severe hypercholesterolemia and atherosclerosis lesions in rabbits with deficiency of low-density lipoprotein receptor (LDLR) on exon 7. *EBioMedicine, 36*: 29–38. https://doi.org/10.1016/j.ebiom.2018.09.020

Luo, J., Yang, H., & Song, B.-L. (2019). Mechanisms and regulation of cholesterol homeostasis. *Nature Reviews Molecular Cell Biology*, *21*. https://doi.org/10.1038/s41580-019-0190-7

Luo, J., Wen, F., Qiu, D., & Wang, S. (2021). Nesfatin-1 in lipid metabolism and lipid-related diseases. *Clinica Chimica Acta*, *522*, 23–30. https://doi.org/10.1016/j.cca.2021.08.005

Ma, F., & Liu, D. (2012). Sketch of the edible bird's nest and its important bioactivities. *Food Research International, 48*(2), 559–567. https://doi.org/10.1016/j.foodres.2012.06.001

Magenta, A., Greco, S., Capogrossi, M. C., Gaetano, C., & Martelli, F. (2014). Nitric oxide, oxidative stress, and p66Shc interplay in diabetic endothelial dysfunction. *BioMed Research International,* 2014, 1–16. https://doi.org/10.1155/2014/193095

Magnani, F., & Mattevi, A. (2019). Structure and mechanisms of ROS generation by NADPH oxidases. *Current Opinion in Structural Biology*, *59*, 91–97. https://doi.org/10.1016/j.sbi.2019.03.001

Mahamuni, S. P., Khose, R. D., Menaa, F., & Badole, S. L. (2012). Therapeutic approaches to drug targets in hyperlipidemia. *BioMedicine*, *2*(4), 137–146. https://doi.org/10.1016/j.biomed.2012.08.002

Mahaq, O., P. Rameli, M. A., Jaoi Edward, M., Mohd Hanafi, N., Abdul Aziz, S., Abu Hassim, H., Mohd Noor, M. H., & Ahmad, H. (2020). The effects of dietary edible bird nest supplementation on learning and memory functions of multigenerational mice. *Brain and Behavior*, *10*(11). https://doi.org/10.1002/brb3.1817

Maiuolo, J., Gliozzi, M., Musolino, V., Carresi, C., Nucera, S., Macrì, R., Scicchitano, M., Bosco, F., Scarano, F., Ruga, S., Zito, M. C., Oppedisano, F., Mollace, R., Paone, S., Palma, E., Muscoli, C., & Mollace, V. (2019). The role of endothelial dysfunction in peripheral blood nerve barrier: molecular mechanisms and pathophysiological implications. *International Journal of Molecular Sciences*, *20*(12), 3022. https://doi.org/10.3390/ijms20123022

Maiuolo, J., Oppedisano, F., Gratteri, S., Muscoli, C., & Mollace, V. (2016). Regulation of uric acid metabolism and excretion. *International Journal of Cardiology*, *213*, 8–14. https://doi.org/10.1016/j.ijcard.2015.08.109

Malaysian Standard MS 2334:2011. (2011). *Edible-birdnest (EBN)-Specification*. Selangor, Malaysia: Department of Standards Malaysia.

Malekmohammad, K., Sewell, R. D. E., & Rafieian-Kopaei, M. (2019). Antioxidants and atherosclerosis: Mechanistic aspects. *Biomolecules*, *9*(8), 301. https://doi.org/10.3390/biom9080301

Mallavia, B., Recio, C., Oguiza, A., Ortiz-Muñoz, G., Lazaro, I., Lopez-Parra, V., Lopez-Franco, O., Schindler, S., Depping, R., Egido, J., & Gomez-Guerrero, C. (2013). Peptide inhibitor of NF-κB translocation ameliorates experimental atherosclerosis. *The American Journal of Pathology, 182*(5), 1910–1921. https://doi.org/10.1016/j.ajpath.2013.01.022

Manea, A. (2012). *Vascular Biology of Reactive Oxygen Species and NADPH Oxidases: Role in Atherogenesis.* Intech Open Access Publisher.

Mann, B., Kumari, A., Kumar, R., Sharma, R., Prajapati, K., Mahboob, S., & Athira, S. (2014). Antioxidant activity of whey protein hydrolysates in milk beverage system. *Journal of Food Science and Technology, 52*(6), 3235-3241. https://doi.org/10.1007/s13197-014-1361-3

Marchesini, G., Bugianesi, E., Forlani, G., Cerrelli, F., Lenzi, M., & et al. (2003). Nonalcoholic fatty liver, steatohepatitis, and the metabolic syndrome. *Hepatology*, *37*(4), 917–923. https://doi.org/10.1053/jhep.2003.50161

Marcone, M. F. (2005). Characterization of the edible bird's nest the "Caviar of the East." *Food Research International*, *38*(10), 1125–1134. https://doi.org/10.1016/j.foodres.2005.02.008

Marques, L. R., Diniz, T. A., Antunes, B. M., Rossi, F. E., Caperuto, E. C., Lira, F. S., & Gonçalves, D. C. (2018). Reverse cholesterol transport: molecular mechanisms and the non-medical approach to enhance HDL cholesterol. *Frontiers in Physiology*, *9*. https://doi.org/10.3389/fphys.2018.00526

Martin, N. H., Trmčić, A., Hsieh, T.-H., Boor, K. J., & Wiedmann, M. (2016). The evolving role of coliforms as indicators of unhygienic processing conditions in dairy foods. *Frontiers in Microbiology*, *7*. https://doi.org/10.3389/fmicb.2016.01549

Martinez-Hervas, S., & Ascaso, J. F. (2019). Hypercholesterolemia. *Encyclopedia of Endocrine Diseases, 1*, 320–326. https://doi.org/10.1016/b978-0-12-801238-3.65340-0

Matsukawa, N., Matsumoto, M., Bukawa, W., Chiji, H., Nakayama, K., Hara, H., & Tsukahara, T. (2011). Improvement of bone strength and dermal thickness due to dietary edible bird's nest extract in ovariectomized rats. *Bioscience, Biotechnology, and Biochemistry*, *75*(3), 590–592. https://doi.org/10.1271/bbb.100705

Mehdi, M. M., Singh, P., & Rizvi, S. I. (2012). Erythrocyte sialic acid content during aging in humans: Correlation with markers of oxidative stress. *Disease Markers*, *32*(3), 179–186. https://doi.org/10.1155/2012/293429

Mehta, J. L., Li, D. Y., Chen, H. J., Joseph, J. and Romeo, F. (2001). Inhibition of lox-1 by statins may relate to upregulation of eNOS. *Biochemical and Biophysical Research Communications, 289*(4): 857–861. https://doi.org/10.1006/bbrc.2001.6070

Mehu, M., Narasimhulu, C. A., & Singla, D. K. (2022). Inflammatory cells in atherosclerosis. *Antioxidants*, *11*(2), 233. https://doi.org/10.3390/antiox11020233

Meram, C., & Wu, J. (2017). Anti-inflammatory effects of egg yolk livetins (α, β, and γ-livetin) fraction and its enzymatic hydrolysates in lipopolysaccharide-induced RAW 264.7 macrophages. *Food Research International*, *100*, 449–459. https://doi.org/10.1016/j.foodres.2017.07.032

Michalak, I., Chojnacka, K., & Marycz, K. (2010). Using ICP-OES and SEM-EDX in biosorption studies. *Microchimica Acta*, *172*(1-2), 65–74. https://doi.org/10.1007/s00604-010-0468-0

Miketinas, D. C., Bray, G. A., Beyl, R. A., Ryan, D. H., Sacks, F. M., & Champagne, C. M. (2019). Fiber intake predicts weight loss and dietary adherence in adults consuming calorie-restricted diets: The POUNDS lost (preventing overweight using novel dietary strategies) study. *The Journal of Nutrition*, *149*(10), 1742–1748. https://doi.org/10.1093/jn/nxz117

Millar, C. L., Jiang, C., Norris, G. H., Garcia, C., Seibel, S., Anto, L., Lee, J.-Y., & Blesso, C. N. (2020). Cow's milk polar lipids reduce atherogenic lipoprotein cholesterol, modulate gut microbiota and attenuate atherosclerosis development in LDL-receptor knockout mice fed a Western-type diet. *The Journal of Nutritional Biochemistry, 79*, 108351. https://doi.org/10.1016/j.jnutbio.2020.108351

Miller, N. J., Rice-Evans, C., Davies, M. J., Gopinathan, V., & Milner, A. (1993). A novel method for measuring antioxidant capacity and its application to monitoring the antioxidant status in premature neonates. *Clinical Science*, *84*(4), 407–412. https://doi.org/10.1042/cs0840407

Ministry of Health Malaysia. Health Facts 2019: Reference Data for 2018; Ministry of Health Malaysia: Kuala Lumpur, Malaysia, 2019. Available online: https://www.moh.gov.my/moh/resources/Penerbitan/Penerbitan%20Utama/HEALTH%20FACTS/Health%20Facts%202019_Booklet.pdf (accessed on 3 January 2021).

Misra, B.B., Puppala, S.R., Comuzzie, A.G., Mahaney, M.C., VandeBerg, J.L., Olivier, M., et al. (2019). Analysis of serum changes in response to a high fat high cholesterol diet challenge reveals metabolic biomarkers of atherosclerosis. *PLoS ONE* *14*(4): e0214487. https://doi.org/10.1371/journal.pone.0214487

Mittal, M., Siddiqui, M. R., Tran, K., Reddy, S. P., & Malik, A. B. (2014). Reactive oxygen species in inflammation and tissue injury: ROS, inflammation, and tissue injury. *Antioxidants & Redox Signaling, 20*(7), 1126-1167. https://dx.doi.org/10.1089%2Fars.2012.5149

Miura, K., Yang, L., van Rooijen, N., Ohnishi, H., & Seki, E. (2012). Hepatic recruitment of macrophages promotes nonalcoholic steatohepatitis through CCR2. *American Journal of Physiology-Gastrointestinal and Liver Physiology*, *302*(11), G1310–G1321. https://doi.org/10.1152/ajpgi.00365.2011

Miyachi, Y., Tsuchiya, K., Komiya, C., Shiba, K., Shimazu, N., Yamaguchi, S., Deushi, M., Osaka, M., Inoue, K., Sato, Y., Matsumoto, S., Kikuta, J., Wake, K., Yoshida, M., Ishii, M., & Ogawa, Y. (2017). Roles for cell-cell adhesion and contact in obesity-induced hepatic myeloid cell accumulation and glucose intolerance. *Cell Reports*, *18*(11), 2766–2779. https://doi.org/10.1016/j.celrep.2017.02.039

MOH, Ministry of Health Singapore. (2015). *Singapore Myocardial Infarction Registry Report No. 3: Trends In Acute Myocardial Infarction In Singapore 2007 – 2013*. https://www.nrdo.gov.sg/docs/librariesprovider3/defaultdocument-library/trends_in_acute_myocardial_infarction_in_singapore-2007-2013_web6ef607a5c9d76bafab5aff000014cdee.pdf?sfvrsn=0

MOH, Ministry of Health Malaysia. (2017). *Management of Dyslipidaemia 2017 5th Edition of Clinical Practice Guidelines*. Ministry of Health, Malaysia.

Mohd Khan, A.; Etty Syarmila, I.K.; Nurfatin, M.H.; Farahniza, Z.; Engku Hanisah, E.U.; Norhasidah, S.; Masitah, E.H.; Masturah, A.K.; Nurul'Ain, M.; Maaruf, A.G.; et al. Antioxidative properties of ready-to-drink products incorporated with enzymatically hydrolysed edible bird nest. In Proceedings of the Edible Bird Nest Industry Conference, Marriot Hotel Putrajaya, Putrajaya, Malaysia, 25–26 November 2014.

Mohd Rosni, S., Fisal, A., Azwan, A., Chye, F.Y. and Matanjun, P. (2015). Crude proteins, total soluble proteins, total phenolic contents and SDS-PAGE profile of fifteen varieties of seaweed from Semporna, Sabah, Malaysia. *International Food Research Journal*, *22*, 1483–1493.

Momtazi-Borojeni, A. A., Banach, M., Majeed, M., & Sahebkar, A. (2019). P5330Evaluating lipid-lowering and anti-atherogenic effect of injectable curcumin in a rabbit model of atherosclerosis. *European Heart Journal*, *40*(Supplement_1). https://doi.org/10.1093/eurheartj/ehz746.0299

Moore, K. J., Sheedy, F. J. and Fisher, E. A. (2013). Macrophages in atherosclerosis: A dynamic balance. *Nature Reviews Immunology, 13*(10): 709–721. https://doi.org/10.1038/nri3520

Mori, Y., Shimizu, H., Kushima, H., Saito, T., Hiromura, M., Terasaki, M., Koshibu, M., Ohtaki, H., & Hirano, T. (2019). Nesfatin-1 suppresses peripheral arterial remodeling without elevating blood pressure in mice. *Endocrine Connections*, *8*(5), 536–546. https://doi.org/10.1530/ec-19-0120

Moss, J. W. E., & Ramji, D. P. (2016). Nutraceutical therapies for atherosclerosis. *Nature Reviews Cardiology, 13*(9), 513–532. https://doi.org/10.1038/nrcardio.2016.103

Mueller, M., Hobiger, S., & Jungbauer, A. (2010). Anti-inflammatory activity of extracts from fruits, herbs and spices. *Food Chemistry*, *122*(4), 987–996. https://doi.org/10.1016/j.foodchem.2010.03.041

Muniz, L. B., Alves-Santos, A. M., Camargo, F., Martins, D. B., Celes, M. R. N., & Naves, M. M. V. (2019). High-lard and high-cholesterol diet, but not high-lard diet, leads to metabolic disorders in a modified dyslipidemia model. *Arquivos Brasileiros de Cardiologia*. https://doi.org/10.5935/abc.20190149

Murad, M., Abdullah, A. & Mustapha, W.A.W. (2013). Antioxidant capacity and amino acid profiles of egg tofu. *American Journal of Applied Sciences*, *10*(11), 1315–1324. https://doi.org/10.3844/ajassp.2013.1315.1324

Murray, R. Z., & Stow, J. L. (2014). Cytokine secretion in macrophages: SNAREs, rabs, and membrane trafficking. *Frontiers in Immunology*, *5*. https://doi.org/10.3389/fimmu.2014.00538

Murugan, D. D., Md Zain, Z., Choy, K. W., Zamakshshari, N. H., Choong, M. J., Lim, Y. M., & Mustafa, M. R. (2020). Edible bird's nest protects against hyperglycemia-induced oxidative stress and endothelial dysfunction. *Frontiers in Pharmacology*, *10*. https://doi.org/10.3389/fphar.2019.01624

Mussbacher, M., Salzmann, M., Brostjan, C., Hoesel, B., Schoergenhofer, C., Datler, H., Hohensinner, P., Basílio, J., Petzelbauer, P., Assinger, A., & Schmid, J. A. (2019). Cell type-specific roles of NF-κB linking inflammation and thrombosis. *Frontiers in Immunology*, *10*. https://doi.org/10.3389/fimmu.2019.00085

Nabi, X.-H., Ma, C.-Y., Manaer, T., Heizati, M., Wulazibieke, B., & Aierken, L. (2016). Anti-atherosclerotic effect of traditional fermented cheese whey in atherosclerotic rabbits and identification of probiotics. *BMC Complementary and Alternative Medicine*, 16(1). https://doi.org/10.1186/s12906-016-1285-8

Nair, A. R., Elks, C. M., Vila, J., Del Piero, F., Paulsen, D. B., & Francis, J. (2014). A blueberry-enriched diet improves renal function and reduces oxidative stress in metabolic syndrome animals: Potential mechanism of TLR4-MAPK signaling pathway. *PLoS ONE*, *9*(11), e111976. https://doi.org/10.1371/journal.pone.0111976

Najafian, L., & Babji, A. S. (2012). A review of fish-derived antioxidant and antimicrobial peptides: Their production, assessment, and applications. *Peptides*, *33*(1), 178–185. https://doi.org/10.1016/j.peptides.2011.11.013

Nakata, M., Gantulga, D., Santoso, P., Zhang, B., Masuda, C., Mori, M., Okada, T., & Yada, T. (2016). Paraventricular NUCB2/Nesfatin-1 supports oxytocin and vasopressin neurons to control feeding behavior and fluid balance in male mice. *Endocrinology*, *157*(6), 2322–2332. https://doi.org/10.1210/en.2015-2082

Nazario, B. (2021). Stress and Cholesterol: Is There a Link? [Review of *Stress and Cholesterol: Is There a Link?*, by S. Bernstein]. *WebMD*. https://www.webmd.com/cholesterol-management/stress-cholesterol-link#:~:text=If%20high%20levels%20of%20stress,LDL%20and%20low%20HDL%20cholesterol.

NCEP-ATP III, National Cholesterol Education Program (NCEP) Expert Panel on Detection, Evaluation, and Treatment of High Blood Cholesterol in

Adults (Adult Treatment Panel III). (2002). Third Report of the National Cholesterol Education Program (NCEP) Expert Panel on Detection, Evaluation, and Treatment of High Blood Cholesterol in Adults (Adult Treatment Panel III) Final Report. *Circulation*, *106*(25), 3143–3143. https://doi.org/10.1161/circ.106.25.3143

Nelson, R. H. (2013). Hyperlipidemia as a risk factor for cardiovascular disease. *Primary Care: Clinics in Office Practice*, *40*(1), 195–211. https://doi.org/10.1016/j.pop.2012.11.003

Newby, A. C. (2005). Dual role of matrix metalloproteinases (Matrixins) in intimal thickening and atherosclerotic plaque rupture. *Physiological Reviews*, *85*(1), 1–31. https://doi.org/10.1152/physrev.00048.2003

Newman, C. B., Preiss, D., Tobert, J. A., Jacobson, T. A., Page, R. L., Goldstein, L. B., Chin, C., Tannock, L. R., Miller, M., Raghuveer, G., Duell, P. B., Brinton, E. A., Pollak, A., Braun, L. T., & Welty, F. K. (2019). Statin safety and associated adverse events: a scientific statement from the american heart association. *Arteriosclerosis, Thrombosis, and Vascular Biology*, *39*(2). https://doi.org/10.1161/atv.0000000000000073

Niimi, M., Chen, Y., Yan, H., Wang, Y., Koike, T. and Fan, J. (2020). Hyperlipidemic rabbit models for anti-atherosclerotic drug development. *Applied Sciences, 10*(23), 8681. https://doi.org/10.3390/app10238681

Nomura, J., Busso, N., Ives, A., Matsui, C., Tsujimoto, S., Shirakura, T., Tamura, M., Kobayashi, T., So, A., & Yamanaka, Y. (2014). Xanthine oxidase inhibition by febuxostat attenuates experimental atherosclerosis in mice. *Scientific Reports*, *4*(1). https://doi.org/10.1038/srep04554

Noor, H. S. M., Babji, A. S., & Lim, S. J. (2018). Nutritional composition of different grades of edible bird's nest and its enzymatic hydrolysis. *AIP Conference Proceedings*. https://doi.org/10.1063/1.5028003

Nordestgaard, B. G., Chapman, M. J., Humphries, S. E., Ginsberg, H. N., Masana, L., Descamps, O. S., Wiklund, O., Hegele, R. A., Raal, F. J., Defesche, J. C., Wiegman, A., Santos, R. D., Watts, G. F., Parhofer, K. G., Hovingh, G. K., Kovanen, P. T., Boileau, C., Averna, M., Boren, J., & Bruckert, E. (2013). Familial hypercholesterolaemia is underdiagnosed and undertreated in the general population: guidance for clinicians to prevent coronary heart disease: Consensus statement of the European atherosclerosis society. *European Heart Journal*, *34*(45), 3478–3490. https://doi.org/10.1093/eurheartj/eht273

Norhayati, M.K., Azman, O. and Wan Nazaimoon, W.M. (2010). Preliminary study of the nutritional content of Malaysian edible bird's nest. *Malaysian Journal of Nutrition*, *16*, 389–396.

Nowak, W. N., Deng, J., Ruan, X. Z., & Xu, Q. (2017). Reactive oxygen species generation and atherosclerosis. *Arteriosclerosis, Thrombosis, and Vascular Biology*, *37*(5). https://doi.org/10.1161/atvbaha.117.309228

Nurul Huda, M. Z., Zuki, A. B. Z., Azhar, K., Goh, Y. M., Suhaimi, H., Awang Hazmi, A. J., & Zairi, M. S. (2008). Proximate, elemental and fatty acid analysis of pre-processed edible bird's nest (*Aerodramus fuciphagus*): A comparison between regions and type of nest. *Journal of Food Technology*, *6*(1), 39–44.

Nurul Nadia, M., Babji, A. S., Ayub, M. K., & Nur 'Aliah, D. (2017). Effect of enzymatic hydrolysis on antioxidant capacity of cave edible bird's nests hydrolysate. *International Journal of ChemTech Research*, *10*(2), 1100–1107.

Odden, M. C., Pletcher, M. J., Coxson, P. G., Thekkethala, D., Guzman, D., Heller, D., Goldman, L., & Bibbins-Domingo, K. (2015). Cost-effectiveness and population impact of statins for primary prevention in adults aged 75 years or older in the United States. *Annals of Internal Medicine, 162*(8), 533. https://doi.org/10.7326/m14-1430

OECD (2001). Oecd Guidelines for the Testing of Chemicals: Acute Oral Toxicity – Acute Toxic Class Method (423).

Olamoyegun, M., Oluyombo, R. and Asaolu, S. (2016). Evaluation of dyslipidemia, lipid ratios, and atherogenic index as cardiovascular risk factors among semi-urban dwellers in Nigeria. *Annals of African Medicine, 15*(4), 194. https://doi.org/10.4103/1596-3519.194280

Olejarz, W., Łacheta, D., & Kubiak-Tomaszewska, G. (2020). Matrix metalloproteinases as biomarkers of atherosclerotic plaque instability. *International Journal of Molecular Sciences*, *21*(11), 3946. https://doi.org/10.3390/ijms21113946

Oliveros, E., Vázquez, E., Barranco, A., Ramírez, M., Gruart, A., Delgado-García, J., Buck, R., Rueda, R., & Martín, M. (2018). Sialic acid and sialylated oligosaccharide supplementation during lactation improves learning and memory in rats. *Nutrients*, *10*(10), 1519. https://doi.org/10.3390/nu10101519

Ooi, D.-J., Iqbal, S., & Ismail, M. (2012). Proximate composition, nutritional attributes and mineral composition of *Peperomia pellucida* L. (Ketumpangan air) grown in Malaysia. *Molecules*, *17*(9), 11139–11145. https://doi.org/10.3390/molecules170911139

Ooi, B., Goh, B., & Yap, W. (2017). Oxidative stress in cardiovascular diseases: Involvement of Nrf2 antioxidant redox signaling in macrophage foam cells formation. *International Journal of Molecular Sciences*, *18*(11), 2336. https://doi.org/10.3390/ijms18112336

Orekhov, A. (2013). Direct anti-atherosclerotic therapy; Development of natural anti-atherosclerotic drugs preventing cellular cholesterol retention. *Current Pharmaceutical Design, 19*(33), 5909–5928. https://doi.org/10.2174/1381612811319330011

Orekhov, A. N., & Ivanova, E. A. (2016). Cellular models of atherosclerosis and their implication for testing natural substances with anti-atherosclerotic potential. *Phytomedicine*, *23*(11), 1190–1197. https://doi.org/10.1016/j.phymed.2016.01.003

Othman, Z. A., Wan Ghazali, W. S., Noordin, L., Mohd. Yusof, N. A., & Mohamed, M. (2019). Phenolic compounds and the anti-atherogenic effect of bee bread in high-fat diet-induced obese rats. *Antioxidants, 9*(1), 33. https://doi.org/10.3390/antiox9010033

Ouimet, M., Barrett, T. J., & Fisher, E. A. (2019). HDL and reverse cholesterol transport. *Circulation Research*, *124*(10), 1505–1518. https://doi.org/10.1161/circresaha.119.312617

Palazhy, S., Kamath, P., & Vasudevan, D. M. (2015). Elevated oxidative stress among coronary artery disease patients on statin therapy: A cross sectional study. *Indian Heart Journal*, *67*(3), 227–232. https://doi.org/10.1016/j.ihj.2015.03.016

Pan, M., Huo, Y., Wang, C., Zhang, Y., Dai, Z., & Li, B. (2019). Positively charged peptides from casein hydrolysate show strong inhibitory effects on LDL oxidation and cellular lipid accumulation in RAW 264.7 cells. *International Dairy Journal*, *91*, 119–128. https://doi.org/10.1016/j.idairyj.2018.09.011

Pandey, E., Nour, A. S., & Harris, E. N. (2020). Prominent receptors of liver sinusoidal endothelial cells in liver homeostasis and disease. *Frontiers in Physiology, 11*, 873. https://doi.org/10.3389/fphys.2020.00873

Panyaarvudh, J. (2018). An economic nesting ground. The Nation. Available at: https://www.nationthailand.com/business/30356222.

Paolicchi, A., Emdin, M., Ghliozeni, E., Ciancia, E., Passino, C., Popoff, G., & Pompella, A. (2004). Human atherosclerotic plaques contain gamma-glutamyl transpeptidase enzyme activity. *Circulation, 109*(11): 1440–1440. https://doi.org/10.1161/01.CIR.0000120558.41356.E6

Park, H.-J., Jung, U. J., Lee, M.-K., Cho, S.-J., Jung, H.-K., Hong, J. H., Park, Y. B., Kim, S. R., Shim, S., Jung, J., & Choi, M.-S. (2012). Modulation of lipid metabolism by polyphenol-rich grape skin extract improves liver steatosis and adiposity in high fat fed mice. *Molecular Nutrition & Food Research*, *57*(2), 360–364. https://doi.org/10.1002/mnfr.201200447

Park, K.-H., Shin, D.-G., & Cho, K.-H. (2014). Dysfunctional lipoproteins from young smokers exacerbate cellular senescence and atherogenesis with smaller particle size and severe oxidation and glycation. *Toxicological Sciences*, *140*(1), 16–25. https://doi.org/10.1093/toxsci/kfu076

Park, E.O., Bae, E.J., Park, B.H. and Chae, S.W. (2020). The associations between liver enzymes and cardiovascular risk factors in adults with mild dyslipidemia. *Journal of Clinical Medicine, 9*, 1147. https://doi.org/10.3390/jcm9041147

Parolini, C., Vik, R., Busnelli, M., Bjørndal, B., Holm, S., Brattelid, T., Manzini, S., Ganzetti, G. S., Dellera, F., Halvorsen, B., Aukrust, P., Sirtori, C. R., Nordrehaug, J. E., Skorve, J., Berge, R. K., & Chiesa, G. (2014). A salmon protein hydrolysate exerts lipid-independent anti-atherosclerotic activity in ApoE-deficient mice. *PLoS ONE, 9*(5), e97598. https://doi.org/10.1371/journal.pone.0097598

Patil, R., & Sood, G. K. (2017). Non-alcoholic fatty liver disease and cardiovascular risk. *World Journal of Gastrointestinal Pathophysiology*, *8*(2), 51–58. https://doi.org/10.4291/wjgp.v8.i2.51

Patten, D. A., & Shetty, S. (2018). More than just a removal service: Scavenger receptors in leukocyte trafficking. *Frontiers in Immunology*, *9*. https://doi.org/10.3389/fimmu.2018.02904

Patti, A. M., Katsiki, N., Nikolic, D., Al-Rasadi, K., & Rizzo, M. (2014). Nutraceuticals in lipid-lowering treatment. *Angiology*, *66*(5), 416–421. https://doi.org/10.1177/0003319714542999

Patti, A. M., Al-Rasadi, K., Katsiki, N., Banerjee, Y., Nikolic, D., Vanella, L., Giglio, R. V., Giannone, V. A., Montalto, G., & Rizzo, M. (2015). Effect of a natural supplement containing curcuma longa, guggul, and chlorogenic acid in patients with metabolic syndrome. *Angiology*, *66*(9), 856–861. https://doi.org/10.1177/0003319714568792

Pawluczyk, I. Z. A., Ghaderi Najafabadi, M., Patel, S., Desai, P., Vashi, D., Saleem, M. A., & Topham, P. S. (2014). Sialic acid attenuates puromycin aminonucleoside-induced desialylation and oxidative stress in human podocytes. *Experimental Cell Research*, *320*(2), 258–268. https://doi.org/10.1016/j.yexcr.2013.10.017

Peng, Z., Chen, B., Zheng, Q., Zhu, G., Cao, W., Qin, X. and Zhang, C. (2020). Ameliorative effects of peptides from the oyster (*Crassostrea hongkongensis*) protein hydrolysates against UVB-induced skin photodamage in mice. *Marine Drugs, 18*, 288.

Phyu Win, P., Chaw Su, M., Yi Linn, W., Yi Myint, Y., & Myo Win, M. (2020). Investigations into the physicochemical properties of raw edible bird's nest and preparation of double boiled soup. *International Journal of Research Publications*, *62*(1). https://doi.org/10.47119/ijrp1006211020201467

Pin, K., Chuah, A. L., Rashih, A. A., Mazura, M., Fadzureena, J., Vimala, S., & Rasadah, M. (2010). Antioxidant and anti-inflammatory activities of extracts of betel leaves (*Piper betle*) from solvents with different polarities. *Journal of Tropical Forest Science*, *22*(4), 448–455. https://www.jstor.org/stable/23616901

Pinto, A., Immohr, M. B., Jahn, A., Jenke, A., Boeken, U., Lichtenberg, A., & Akhyari, P. (2016). The extracellular isoform of superoxide dismutase has a significant impact on cardiovascular ischaemia and reperfusion injury during cardiopulmonary bypass. *European Journal of Cardio-Thoracic Surgery*, *50*(6), 1035–1044. https://doi.org/10.1093/ejcts/ezw216

Pirillo, A., Norata, G. D., & Catapano, A. L. (2013). LOX-1, oxLDL, and atherosclerosis. *Mediators of Inflammation, 2013*, 152786. https://doi.org/10.1155/2013/152786

Pizzino, G., Irrera, N., Cucinotta, M., Pallio, G., Mannino, F., Arcoraci, V., Squadrito, F., Altavilla, D. and Bitto, A. (2017). Oxidative stress: Harms and benefits for human health. *Oxidative Medicine and Cellular Longevity, 2017*, 1–13. https://doi.org/10.1155/2017/8416763.

Platzer, M., Kiese, S., Herfellner, T., Schweiggert-Weisz, U., Miesbauer, O., & Eisner, P. (2021). Common trends and differences in antioxidant activity analysis of phenolic substances using single electron transfer based assays. *Molecules*, *26*(5), 1244. https://doi.org/10.3390/molecules26051244

Podrez, E. A. (2010). Anti-oxidant properties of high-density lipoprotein and atherosclerosis. *Clinical and Experimental Pharmacology and Physiology*, *37*(7), 719–725. https://doi.org/10.1111/j.1440-1681.2010.05380.x

Poutzalis, S., Anastasiadou, A., Nasopoulou, C., Megalemou, K., Sioriki, E., & Zabetakis, I. (2015). Evaluation of the *in vitro* anti-atherogenic activities of goat milk and goat dairy products. *Dairy Science & Technology, 96*(3), 317–327. https://doi.org/10.1007/s13594-015-0266-x

Prior, R. L. (2015). Oxygen radical absorbance capacity (ORAC): New horizons in relating dietary antioxidants/bioactives and health benefits. *Journal of Functional Foods*, *18*, 797–810. https://doi.org/10.1016/j.jff.2014.12.018

Quek, M. C., Chin, N. L., Yusof, Y. A., Law, C. L., & Tan, S. W. (2018). Characterization of edible bird's nest of different production, species and geographical origins using nutritional composition, physicochemical properties and antioxidant activities. *Food Research International*, *109*, 35–43. https://doi.org/10.1016/j.foodres.2018.03.078

Rabu, M. R., & Nazmi, M. S. (2015, April 17). Malaysia's Edible Bird Nest (EBN) Industry. FFTC Agricultural Policy Platform (FFTC-AP). https://ap.fftc.org.tw/article/843

Rached, F. H., Chapman, M. J., & Kontush, A. (2015). HDL particle subpopulations: Focus on biological function. *BioFactors, 41*(2), 67–77. https://doi.org/10.1002/biof.1202

Rada, P., González-Rodríguez, Á., García-Monzón, C., & Valverde, Á. M. (2020). Understanding lipotoxicity in NAFLD pathogenesis: Is CD36 a key driver? *Cell Death & Disease*, *11*(9). https://doi.org/10.1038/s41419-020-03003-w

Rafieian-Kopaei, M., Setorki, M., Doudi, M., Baradaran, A., & Nasri, H. (2014). Atherosclerosis: Process, indicators, risk factors and new hopes. *International Journal of Preventive Medicine*, *5*(8), 927–946.

Rai, H., Parveen, F., Kumar, S., Kapoor, A., & Sinha, N. (2014). Association of endothelial nitric oxide synthase gene polymorphisms with coronary artery disease: An updated meta-analysis and systematic review. *PLoS ONE*, *9*(11), e113363. https://doi.org/10.1371/journal.pone.0113363

Rai, Y., Pathak, R., Kumari, N., Sah, D. K., Pandey, S., Kalra, N., Soni, R., Dwarakanath, B. S., & Bhatt, A. N. (2018). Mitochondrial biogenesis and metabolic hyperactivation limits the application of MTT assay in the estimation of radiation induced growth inhibition. *Scientific Reports*, *8*(1). https://doi.org/10.1038/s41598-018-19930-w

Rajendran, P., Nandakumar, N., Rengarajan, T., Palaniswami, R., Gnanadhas, E. N., Lakshminarasaiah, U., Gopas, J., & Nishigaki, I. (2014). Antioxidants and human diseases. *Clinica Chimica Acta*, *436*, 332–347. https://doi.org/10.1016/j.cca.2014.06.004

Ramkumar, S., Raghunath, A., & Raghunath, S. (2016). Statin therapy: Review of safety and potential side effects. *Acta Cardiologica Sinica, 32*(6), 631–639. https://doi.org/10.6515/ACS20160611A

Rao, L. V., Okorodudu, A. O., Petersen, J. R., & Elghetany, M. T. (2000). Stability of prothrombin time and activated partial thromboplastin time tests under different storage conditions. *Clinica Chimica Acta*, 300(1–2): 13–21. https://doi.org/10.1016/S0009-8981(00)00288-6

Rashed, A. A., Ahmad, H., Abdul Khalid, S. K., & Rathi, D.-N. G. (2021). The potential use of sialic acid from edible bird's nest to attenuate mitochondrial dysfunction by *in vitro* study. *Frontiers in Pharmacology*, *12*. https://doi.org/10.3389/fphar.2021.633303

Ravussin, A., Youm, Y.-H., Sander, J., Ryu, S., Nguyen, K., Varela, L., Shulman, G. I., Sidorov, S., Horvath, T. L., Schultze, J. L., & Dixit, V. D. (2018). Loss of nucleobindin-2 causes insulin resistance in obesity without impacting satiety or adiposity. *Cell Reports*, *24*(5), 1085-1092.e6. https://doi.org/10.1016/j.celrep.2018.06.112

Rehman, A.A., Riaz, A., Asghar, M.A., Raza, M.L., Ahmed, S. and Khan, K. (2019). *In vivo* assessment of anticoagulant and antiplatelet effects of Syzygium cumini leaves extract in rabbits. *BMC Complementary and Alternative Medicine*, *19*: 236. https://doi.org/10.1186/s12906-019-2661-y

Reitzer, L. (2014). Amino Acid Synthesis. *Reference Module in Biomedical Sciences*. https://doi.org/10.1016/b978-0-12-801238-3.02427-2

Remmerie, A., & Scott, C. L. (2018). Macrophages and lipid metabolism. *Cellular Immunology*, *330*, 27–42. https://doi.org/10.1016/j.cellimm.2018.01.020

Riaz, A., & Khan, R. A. (2016). Anticoagulant, antiplatelet and antianemic effects of *Punica granatum* (Pomegranate) juice in rabbits. *Blood Coagulation & Fibrinolysis,* *27*(3): 287–293. https://doi.org/10.1097/MBC.0000000000000415

Ribeiro, S. M. L., Luz, S. dos S., & Aquino, R. de C. (2015). The role of nutrition and physical activity in cholesterol and aging. *Clinics in Geriatric Medicine*, *31*(3), 401–416. https://doi.org/10.1016/j.cger.2015.04.010

Ridker, P. M., Everett, B. M., Thuren, T., MacFadyen, J. G., Chang, W. H., Ballantyne, C., Fonseca, F., Nicolau, J., Koenig, W., Anker, S. D., Kastelein, J. J. P., Cornel, J. H., Pais, P., Pella, D., Genest, J., Cifkova, R., Lorenzatti, A., Forster, T., Kobalava, Z., & Vida-Simiti, L. (2017). Antiinflammatory therapy with canakinumab for atherosclerotic disease. *New England Journal of Medicine*, *377*(12), 1119–1131. https://doi.org/10.1056/nejmoa1707914

Rizzo, M., Giglio, R. V., Nikolic, D., Patti, A. M., Campanella, C., Cocchi, M., Katsiki, N., & Montalto, G. (2014). Effects of chitosan on plasma lipids and lipoproteins. *Angiology*, *65*(6), 538–542. https://doi.org/10.1177/0003319713493126

RNI Recommended Nutrient Intakes for Malaysia. *A Report of the Technical Working Group on Nutritional Guidelines*; National Coordinating Committee on Food and Nutrition, Ministry of Health Malaysia: Putrajaya, Malaysia, 2017.

Rodriguez, A. L., Wojcik, B. M., Wrobleski, S. K., Myers, D. D., Wakefield, T. W., & Diaz, J. A. (2012). Statins, inflammation and deep vein thrombosis: a systematic review. *Journal of Thrombosis and Thrombolysis*, *33*(4), 371–382. https://doi.org/10.1007/s11239-012-0687-9

Rop, O., Mlcek, J., Jurikova, T., Neugebauerova, J., & Vabkova, J. (2012). Edible flowers—A new promising source of mineral elements in human nutrition. *Molecules*, *17*(6), 6672–6683. https://doi.org/10.3390/molecules17066672

Rozhkova, A. V., Dmitrieva, V. G., Nosova, E. V., Dergunov, A. D., Limborska, S. A., & Dergunova, L. V. (2021). Genomic variants and multilevel regulation of ABCA1, ABCG1, and SCARB1 expression in atherogenesis. *Journal of Cardiovascular Development and Disease, 8*(12), 170. https://doi.org/10.3390/jcdd8120170

Ruscica, M., Gomaraschi, M., Mombelli, G., Macchi, C., Bosisio, R., Pazzucconi, F., Pavanello, C., Calabresi, L., Arnoldi, A., Sirtori, C. R., & Magni, P. (2014). Nutraceutical approach to moderate cardiometabolic risk:

Results of a randomized, double-blind and crossover study with Armolipid Plus. *Journal of Clinical Lipidology, 8*(1), 61–68. https://doi.org/10.1016/j.jacl.2013.11.003

Saad, F. S. A., Shakaff, A. Y. M., Zakaria, A., Abdullah, M. Z., Adom, A. H., & Ezanuddin, A. A. M. (2012). Edible bird nest shape quality assessment using machine vision system. *2012 Third International Conference on Intelligent Systems Modelling and Simulation*. https://doi.org/10.1109/isms.2012.75

Sacks, F. M., Lichtenstein, A. H., Wu, J. H. Y., Appel, L. J., Creager, M. A., Kris-Etherton, P. M., Miller, M., Rimm, E. B., Rudel, L. L., Robinson, J. G., Stone, N. J., Van Horn, L. V., & American Heart Association. (2017). Dietary fats and cardiovascular disease: A presidential advisory from the American Heart Association. *Circulation*, *136*(3), e1–e23. https://doi.org/10.1161/CIR.0000000000000510

Sacks, F. M., & Jensen, M. K. (2018). From high-density lipoprotein cholesterol to measurements of function. *Arteriosclerosis, Thrombosis, and Vascular Biology, 38*(3), 487–499. https://doi.org/10.1161/atvbaha.117.307025

Sadi, G., Pektaş, M. B., Koca, H. B., Tosun, M., & Koca, T. (2015). Resveratrol improves hepatic insulin signaling and reduces the inflammatory response in streptozotocin-induced diabetes. *Gene*, *570*(2), 213–220. https://doi.org/10.1016/j.gene.2015.06.019

Saengkrajang, W., Matan, N., & Matan, N. (2013). Nutritional composition of the farmed edible bird's nest (*Collocalia fuciphaga*) in Thailand. *Journal of Food Composition and Analysis*, *31*(1), 41–45. https://doi.org/10.1016/j.jfca.2013.05.001

Saisavoey, T., Sangtanoo, P., Reamtong, O., & Karnchanatat, A. (2019). Free radical scavenging and anti-inflammatory potential of a protein hydrolysate derived from salmon bones on RAW 264.7 macrophage cells. *Journal of the Science of Food and Agriculture*, *99*(11), 5112–5121. https://doi.org/10.1002/jsfa.9755

Salazar, J. H. (2014). Overview of Urea and Creatinine. *Laboratory Medicine*, *45*(1), e19–e20. https://doi.org/10.1309/lm920sbnzpjrjgut

Salvamani, S., Gunasekaran, B., Shukor, M. Y., Shaharuddin, N. A., Sabullah, M. K., & Ahmad, S. A. (2016). Anti-HMG-CoA reductase, antioxidant, and anti-inflammatory activities of *Amaranthus viridis* leaf extract as a potential treatment for hypercholesterolemia. *Evidence-Based Complementary and Alternative Medicine*, *2016*, 1–10. https://doi.org/10.1155/2016/8090841

Samuel, Varman T., & Shulman, Gerald I. (2012). Mechanisms for insulin resistance: Common threads and missing links. *Cell*, *148*(5), 852–871. https://doi.org/10.1016/j.cell.2012.02.017

Schaeffer, D.F., Riazy, M., Parhar, K.S. et al. (2009). LOX-1 augments oxLDL uptake by lysoPC-stimulated murine macrophages but is not required for oxLDL clearance from plasma. *Journal of Lipid Research. 50*: 1676–84.

Schneider, C. A., Rasband, W. S., & Eliceiri, K. W. (2012). NIH Image to ImageJ: 25 years of image analysis. *Nature Methods*, *9*(7), 671–675. https://doi.org/10.1038/nmeth.2089

Sears, B., & Perry, M. (2015). The role of fatty acids in insulin resistance. *Lipids in Health and Disease*, *14*(1). https://doi.org/10.1186/s12944-015-0123-1

Seidman, M. A., Mitchell, R. N., & Stone, J. R. (2014). Pathophysiology of atherosclerosis. In Cellular and Molecular Pathobiology of Cardiovascular Disease (pp. 221–237). *Elsevier.* https://doi.org/10.1016/B978-0-12-405206-2.00012-0

Senoner, T., & Dichtl, W. (2019). Oxidative stress in cardiovascular diseases: Still a therapeutic target? *Nutrients, 11*(9), 2090. https://doi.org/10.3390/nu11092090

Seow, E. K., Ibrahim, B., Muhammad, S. A., Lee, L. H., Lalung, J., & Cheng, L. H. (2016). Discrimination between cave and house-farmed edible bird's nest based on major mineral profiles. *Pertanika Journal of Tropical Agricultural Science*, *39*(2), 181–195.

Shakirin, F. H., Azlan, A., Ismail, A., Amom, Z., & Yuon, L. C. (2012). Antiatherosclerotic effect of *Canarium odontophyllum* miq. Fruit parts in rabbits fed high cholesterol diet. Evidence-Based Complementary and Alternative Medicine, 2012, 1–10. https://doi.org/10.1155/2012/838604

Shao, J., Zhang, G., Fu, J., & Zhang, B. (2020). Advancement of the preparation methods and biological activity of peptides from sesame oil byproducts: a review. *International Journal of Food Properties*, *23*(1), 2189–2200. https://doi.org/10.1080/10942912.2020.1849276

Shatoor, A.S., Humayed, S.A., Alkhateeb, M.A., Shatoor, K.A., Aldera. H., Alassiri, M. and Shati, A.A. (2019). *Crataegus Aronia* protects and reverses vascular inflammation in a high fat diet rat model by an antioxidant mechanism and modulating serum levels of oxidized low-density lipoprotein. *Journal of Pharmaceutical Biology, 57*(1), 37-47.

Shim, E.K.S., Chandra, G. F., Pedireddy, S., & Lee, Soo-Y. (2016). Characterization of swiftlet edible bird nest, a mucin glycoprotein, and its adulterants by Raman microspectroscopy. *Journal of Food Science and Technology*, *53*(9), 3602–3608. https://doi.org/10.1007/s13197-016-2344-3

Shim, E. K., & Lee, S. (2020). Calcite deposits differentiate cave from house-farmed edible bird's nest as shown by SEM-EDX, ATR-FTIR and Raman microspectroscopy. *Chemistry – an Asian Journal*, *15*(16), 2487–2492. https://doi.org/10.1002/asia.202000520

Shin, J.W., Seol, I.C. and Son, C.G. (2010). Interpretation of animal dose and human equivalent dose for drug development. *The Journal of Korean Oriental Medicine, 31.*

Shinners, T.C. & Tewari, J.P. (1997). Diversity in crystal production by some bird's nest fungi (Nidulariaceae) in culture. *Canadian Journal of Chemistry, 75*, 850–856.

Shiomi, M., Yamada, S. and Ito, T. (2005). Atheroma stabilizing effects of simvastatin due to depression of macrophages or lipid accumulation in the atheromatous plaques of coronary plaque prone WHHL rabbits. *Atherosclerosis, 178*:287–94.

Shrestha, S., Wu, B. J., Guiney, L., Barter, P. J., & Rye, K.-A. (2018). Cholesteryl ester transfer protein and its inhibitors. *Journal of Lipid Research, 59*(5), 772–783. https://doi.org/10.1194/jlr.R082735

Silverman, M. G., Ference, B. A., Im, K., Wiviott, S. D., Giugliano, R. P., Grundy, S. M., Braunwald, E., & Sabatine, M. S. (2016). Association between lowering LDL-C and cardiovascular risk reduction among different therapeutic interventions. *JAMA*, *316*(12), 1289. https://doi.org/10.1001/jama.2016.13985

Słowińska, M., Liszewska, E., Nynca, J., Bukowska, J., Hejmej, A., Bilińska, B., Szubstarski, J., Kozłowski, K., Jankowski, J., & Ciereszko, A. (2014). Isolation and characterization of an ovoinhibitor, a multidomain kazal-like inhibitor from turkey (*Meleagris gallopavo*) seminal plasma. *Biology of Reproduction*, *91*(5). https://doi.org/10.1095/biolreprod.114.118836

Sluiter, T. J., van Buul, J. D., Huveneers, S., Quax, P. H. A., & de Vries, M. R. (2021). Endothelial barrier function and leukocyte transmigration in atherosclerosis. *Biomedicines,* *9*(4), 328. https://doi.org/10.3390/biomedicines9040328

Smith-Ryan, A. E., Hirsch, K. R., Saylor, H. E., Gould, L. M., & Blue, M. N. M. (2020). Nutritional considerations and strategies to facilitate injury recovery and rehabilitation. *Journal of Athletic Training*, *55*(9), 918–930. https://doi.org/10.4085/1062-6050-550-19

Snezhkina, A. V., Kudryavtseva, A. V., Kardymon, O. L., Savvateeva, M. V., Melnikova, N. V., Krasnov, G. S., & Dmitriev, A. A. (2019). ROS generation and antioxidant defense systems in normal and malignant cells. *Oxidative Medicine and Cellular Longevity*, *2019*, 1–17. https://doi.org/10.1155/2019/6175804

Sniderman, A. D., Qi, Y., Ma, C.-I. J., Wang, R. H. L., Naples, M., Baker, C., Zhang, J., Adeli, K., & Kiss, R. S. (2013). Hepatic Cholesterol

Homeostasis. *Arteriosclerosis, Thrombosis, and Vascular Biology*, *33*(11), 2481–2490. https://doi.org/10.1161/atvbaha.113.301517

Snyder, A. B., & Worobo, R. W. (2018). Fungal spoilage in food processing. *Journal of Food Protection*, *81*(6), 1035–1040. https://doi.org/10.4315/0362-028x.jfp-18-031

Soares, R., Mendonça, S., de Castro, L. Í., Menezes, A., & Arêas, J. (2015). Major peptides from amaranth (*Amaranthus cruentus*) protein inhibit HMG-CoA reductase activity. *International Journal of Molecular Sciences*, *16*(2), 4150–4160. https://doi.org/10.3390/ijms16024150

Sobenin, I. A., Andrianova, I. V., Lakunin, K. Y., Karagodin, V. P., Bobryshev, Y. V., & Orekhov, A. N. (2016). Anti-atherosclerotic effects of garlic preparation in freeze injury model of atherosclerosis in cholesterol-fed rabbits. *Phytomedicine*, *23*(11), 1235–1239. https://doi.org/10.1016/j.phymed.2015.10.014

Sonal Sekhar, M., Marupuru, S., Reddy, B. S., Kurian, S. J., & Rao, M. (2020). Physiological role of cholesterol in human body. *Dietary Sugar, Salt and Fat in Human Health*, 453–481. https://doi.org/10.1016/b978-0-12-816918-6.00021-4

Soufli, I., Toumi, R., Rafa, H., & Touil-Boukoffa, C. (2016). Overview of cytokines and nitric oxide involvement in immuno-pathogenesis of inflammatory bowel diseases. *World Journal of Gastrointestinal Pharmacology and Therapeutics*, *7*(3), 353–360. https://doi.org/10.4292/wjgpt.v7.i3.35

Souyoul, S. A., Saussy, K. P., & Lupo, M. P. (2018). Nutraceuticals: A Review. *Dermatology and Therapy, 8*(1), 5–16. https://doi.org/10.1007/s13555-018-0221-x.

Sozański, T., Kucharska, A. Z., Szumny, A., Magdalan, J., Bielska, K., Merwid-Ląd, A., Woźniak, A., Dzimira, S., Piórecki, N., & Trocha, M. (2014). The protective effect of the *Cornus mas* fruits (cornelian cherry) on hypertriglyceridemia and atherosclerosis through PPARα activation in hypercholesterolemic rabbits. *Phytomedicine, 21*(13), 1774–1784. https://doi.org/10.1016/j.phymed.2014.09.005.

Srimahachota, S., Boonyaratavej, S., Kanjanavanit, R., Sritara, P., Krittayaphong, R., Kunjara-Na-Ayudhya, R., Tatsanavivat, P., Chiang, M., Hospital, C., Mai, & Thailand. (2012). Thai Registry in Acute Coronary Syndrome (TRACS) - An Extension of Thai Acute Coronary Syndrome Registry (TACS) Group: Lower in-hospital but still high mortality at one-year. *Journal of Medical Association of Thailand*, *95*(4), 508-518.

Staudigl, C., Concin, N., Grimm, C., Pfeiler, G., Nehoda, R., Singer, C. F., & Polterauer, S. (2015). Prognostic relevance of pretherapeutic gamma-glutamyltransferase in patients with primary metastatic breast cancer.

PLOS ONE, 10(4), e0125317. https://doi.org/10.1371/journal.pone.0125317

Stone, N. J., Robinson, J. G., Lichtenstein, A. H., Bairey Merz, C. N., Blum, C. B., Eckel, R. H., Goldberg, A. C., Gordon, D., Levy, D., Lloyd-Jones, D. M., McBride, P., Schwartz, J. S., Shero, S. T., Smith, S. C., Watson, K., & Wilson, P. W. F. (2014). 2013 ACC/AHA guideline on the treatment of blood cholesterol to reduce atherosclerotic cardiovascular risk in adults. *Journal of the American College of Cardiology*, *63*(25), 2889–2934. https://doi.org/10.1016/j.jacc.2013.11.002

Straub, D. A. (2007). Calcium supplementation in clinical practice: A review of forms, doses, and indications. *Nutrition in Clinical Practice*, *22*(3), 286–296. https://doi.org/10.1177/0115426507022003286

Suckow, M.A., Stevens, K.A. and Wilson, R.P. (2012). The laboratory rabbit, guinea pig, hamster, and other rodents (First ed.). San Diego, USA: Academic Press; 2012.

Sujatha, R., & Kavitha, S. (2017). Atherogenic indices in stroke patients: A retrospective study. *Iran J Neurol*. *16*(2), 78-82.

Sun, H.-J., Wu, Z.-Y., Nie, X.-W., & Bian, J.-S. (2020). Role of Endothelial Dysfunction in Cardiovascular Diseases: The Link Between Inflammation and Hydrogen Sulfide. *Frontiers in Pharmacology*, *10*. https://doi.org/10.3389/fphar.2019.01568

Surma, S., & Banach, M. (2021). Fibrinogen and atherosclerotic cardiovascular diseases—review of the literature and clinical studies. *International Journal of Molecular Sciences*, *23*(1), 193. https://doi.org/10.3390/ijms23010193

Sviridov, D., Mukhamedova, N., T. Remaley, A., Chin-Dusting, J., & Nestel, P. (2008). Antiatherogenic functionality of high density lipoprotein: How much versus how good. *Journal of Atherosclerosis and Thrombosis*, *15*(2), 52–62. https://doi.org/10.5551/jat.e571

Syväranta, S., Alanne-Kinnunen, M., Öörni, K., Oksjoki, R., Kupari, M., Kovanen, P. T., & Helske-Suihko, S. (2014). Potential pathological roles for oxidized low-density lipoprotein and scavenger receptors SR-AI, CD36, and LOX-1 in aortic valve stenosis. *Atherosclerosis*, *235*(2), 398–407. https://doi.org/10.1016/j.atherosclerosis.2014.05.933

Tai, S. K., Hamzah, Z., Ng, Q. H., & Tan, C. S. (2020). Surface morphology study on unclean, commercial and bromelain treated edible bird nest (EBN) using scanning electron microscope. *IOP Conference Series: Materials Science and Engineering*, *932*(1), 012013. https://doi.org/10.1088/1757-899x/932/1/012013

Takiguchi, S., Ayaori, M., Yakushiji, E., Nishida, T., Nakaya, K., Sasaki, M., Iizuka, M., Uto-Kondo, H., Terao, Y., Yogo, M., Komatsu, T., Ogura, M.,

& Ikewaki, K. (2018). Hepatic overexpression of endothelial lipase lowers high-density lipoprotein but maintains reverse cholesterol transport in mice. A*rteriosclerosis, Thrombosis, and Vascular Biology, 38*(7), 1454–1467. https://doi.org/10.1161/atvbaha.118.311056

Tan, S. N., Sani, D., Lim, C. W., Ideris, A., Stanslas, J., & Lim, C. T. S. (2020). Proximate analysis and safety profile of farmed edible bird's nest in Malaysia and its effect on cancer cells. *Evidence-Based Complementary and Alternative Medicine*, *2020*, 1–12. https://doi.org/10.1155/2020/8068797

Tani, S., Nagao, K., Anazawa, T., Kawamata, H., Furuya, S., Takahashi, H., Iida, K., Matsumoto, M., Washio, T., Kumabe, N., & Hirayama, A. (2009). Association of leukocyte subtype counts with coronary atherosclerotic regression following pravastatin treatment. *The American Journal of Cardiology*, *104*(4), 464–469. https://doi.org/10.1016/j.amjcard.2009.04.009

Targher, G., Day, C.P. and Bonora E. (2010). Risk of cardiovascular disease in patients with nonalcoholic fatty liver disease. *The New England Journal of Medicine, 363:1341–50.*

Taylor, F., Huffman, M. D., Macedo, A. F., Moore, T. H., Burke, M., Davey Smith, G., Ward, K., & Ebrahim, S. (2013). Statins for the primary prevention of cardiovascular disease. *Cochrane Database of Systematic Reviews*. https://doi.org/10.1002/14651858.cd004816.pub5

Tee, E.S., Noor, M.I., Azudin, M.N. and Idris, K.I. (1997). Nutrient Composition of Malaysian Foods. 4th Edition. Kuala Lumpur, Malaysia: Institute for Medical Research.

The Emerging Risk Factors Collaboration. (2012). Lipid-related markers and cardiovascular disease prediction. *JAMA*, *307*(23). https://doi.org/10.1001/jama.2012.6571

Tian, H., Liu, Q., Qin, S., Zong, C., Zhang, Y., Yao, S., Yang, N., Guan, T., & Guo, S. (2017). Synthesis and cardiovascular protective effects of quercetin 7-O-sialic acid. *Journal of Cellular and Molecular Medicine*, *21*(1), 107–120. https://doi.org/10.1111/jcmm.12943

Timmins, J. M., Lee, J.-Y., Boudyguina, E., Kluckman, K. D., Brunham, L. R., Mulya, A., Gebre, A. K., Coutinho, J. M., Colvin, P. L., Smith, T. L., Hayden, M. R., Maeda, N., & Parks, J. S. (2005). Targeted inactivation of hepatic Abca1 causes profound hypoalphalipoproteinemia and kidney hypercatabolism of apoA-I. *Journal of Clinical Investigation*, *115*(5), 1333–1342. https://doi.org/doi: 10.1172/JCI23915

Toney, M. D. (2013). Pyridoxal Phosphate. *Encyclopedia of Biological Chemistry*, 708–711. https://doi.org/10.1016/b978-0-12-378630-2.00024-4

Tosello-Trampont, A.-C., Landes, S. G., Nguyen, V., Novobrantseva, T. I., & Hahn, Y. S. (2012). Kuppfer cells trigger nonalcoholic steatohepatitis development in diet-induced mouse model through tumor necrosis factor-α production. *Journal of Biological Chemistry*, *287*(48), 40161–40172. https://doi.org/10.1074/jbc.m112.417014

Tousoulis, D., Kampoli, A.-M., Tentolouris, C., Papageorgiou, N., & Stefanadis, C. (2012). The role of nitric oxide on endothelial function. *Current Vascular Pharmacology*, *10*(1), 4–18. https://doi.org/10.2174/157016112798829760

Trapani, L., Segatto, M., & Pallottini, V. (2012). Regulation and deregulation of cholesterol homeostasis: The liver as a metabolic "power station." *World Journal of Hepatology*, *4*(6), 184. https://doi.org/10.4254/wjh.v4.i6.184

Trebicka, J., & Schierwagen, R. (2015). Statins, Rho GTPases and KLF2: New mechanistic insight into liver fibrosis and portal hypertension. *Gut, 64*(9), 1349–1350. https://doi.org/10.1136/gutjnl-2014-308800

Tsui, P.-F., Lin, C.-S., Ho, L.-J., & Lai, J.-H. (2018). Spices and atherosclerosis. *Nutrients*, *10*(11), 1724. https://doi.org/10.3390/nu10111724

Tu, Z., Moss-Pierce, T., Ford, P., & Jiang, T. A. (2013). Rosemary (*Rosmarinus officinalis L*.) extract regulates glucose and lipid metabolism by activating AMPK and PPAR pathways in HepG2 cells. *Journal of Agricultural and Food Chemistry*, *61*(11), 2803–2810. https://doi.org/10.1021/jf400298c

U.S. Food and Drug Administration/Bacteriological Analytical Manual (FDA/BAM). Available online: https://www.fda.gov/food/laboratory-methods-food/bacteriological-analytical-manual-bam (accessed on 23–27 August 2021).

Ullevig, S. L., Zhao, Q., Zamora, D., & Asmis, R. (2011). Ursolic acid protects diabetic mice against monocyte dysfunction and accelerated atherosclerosis. *Atherosclerosis*, *219*(2), 409–416. https://doi.org/10.1016/j.atherosclerosis.2011.06.013

Um, M. Y., Ahn, J., Jung, C. H., & Ha, T. Y. (2013). Cholesterol-lowering effect of rice protein by enhancing fecal excretion of lipids in rats. *Preventive Nutrition and Food Science*, *18*(3), 210–213. https://doi.org/10.3746/pnf.2013.18.3.210

Um, M. Y., Hwang, K. H., Choi, W. H., Ahn, J., Jung, C. H., & Ha, T. Y. (2014). Curcumin attenuates adhesion molecules and matrix metalloproteinase expression in hypercholesterolemic rabbits. *Nutrition Research*, *34*(10), 886–893. https://doi.org/10.1016/j.nutres.2014.09.001

Ustyol, A., Aycan Ustyol, E., Gurdol, F., Kokali, F., & Bekpınar, S. (2017). P-selectin, endocan, and some adhesion molecules in obese children and adolescents with non-alcoholic fatty liver disease. *Scandinavian Journal* *of Clinical and Laboratory Investigation*, *77*(3), 205–209. https://doi.org/10.1080/00365513.2017.1292363

Utomo, B., Rosyidi, D., Radiati, L., Puspaningsih, N., & Proborini, W. (2014). Protein characterization of extracted water from three kinds of edible bird nest using SDS-PAGE CBB staining and SDS-PAGE glycoprotein staining and LC-MS/MS analyses. *IOSR Journal of Agriculture and Veterinary Science*, *7*(9), 33–38. https://doi.org/10.9790/2380-07933338

Vacek, T., Rahman, S., Yu, S., Neamtu, D., Givimani, S., & Tyagi, S. (2015). Matrix metalloproteinases in atherosclerosis: Role of nitric oxide, hydrogen sulfide, homocysteine, and polymorphisms. *Vascular Health and Risk Management*, 173. https://doi.org/10.2147/vhrm.s68415

van Beek, J. H. D. A., de Moor, M. H. M., de Geus, E. J. C., Lubke, G. H., Vink, J. M., Willemsen, G., & Boomsma, D. I. (2013). The genetic architecture of liver enzyme levels: GGT, ALT and AST. *Behavior Genetics, 43*(4): 329–339. https://doi.org/10.1007/s10519-013-9593-y

van Hinsbergh, V. W. M. (2011). Endothelium—role in regulation of coagulation and inflammation. *Seminars in Immunopathology, 34*(1), 93–106. https://doi.org/10.1007/s00281-011-0285-5

Varedesara, M. S., Ariaii, P., & Hesari, J. (2021). The effect of grape seed protein hydrolysate on the properties of stirred yogurt and viability of Lactobacillus casei in it. *Food Science & Nutrition, 9*(4), 2180–2190. https://doi.org/10.1002/fsn3.2188

Vargas, J. I., Arrese, M., Shah, V. H., & Arab, J. P. (2017). Use of statins in patients with chronic liver disease and cirrhosis: Current views and prospects. *Current Gastroenterology Reports*, *19*(9), 43. https://doi.org/10.1007/s11894-017-0584-7

Vassilis, I., Shi, S., & Panagiotis, F. (2017). Role of apolipoproteins, ABCA1 and LCAT in the biogenesis of normal and aberrant high density lipoproteins. *The Journal of Biomedical Research*, *31*(6), 471. https://doi.org/10.7555/jbr.31.20160082

Vazquez, G. (2012). TRPC channels as prospective targets in atherosclerosis terra incognita. *Frontiers in Bioscience*, *S4*(1), 157–166. https://doi.org/10.2741/s258

Venugopal, S. K., Anoruo, M., & Jialal, I. (2021). *Biochemistry, low density lipoprotein*. StatPearls Publishing, Treasure Island (FL). http://europepmc.org/books/NBK500010

Vieira, R. A. L., Freitas, R. N. D., & Volp, A. Ca. P. (2014). Adhesion molecules and chemokines: Relation to anthropometric, body composition, biochemical and dietary variables. *Nutricion Hospitalaria*, *30*(2), 223–236. http://doi.org/doi: 10.3305/nh.2014.30.2.7416.

Vimala, B., Hussain, H., & Nazaimoon, W. M. W. (2012). Effects of edible bird's nest on tumour necrosis factor-alpha secretion, nitric oxide production and cell viability of lipopolysaccharide-stimulated RAW 264.7 macrophages. *Food and Agricultural Immunology*, *23*(4), 303–314. https://doi.org/10.1080/09540105.2011.625494

Virani, S.S., Alonso, A., Benjamin, E.J., Bittencourt, M.S., Callaway, C.W., Carson, A.P., Chamberlain, A.M., Chang, A.R., Cheng, S., Delling, F.N. et al. (2020). Heart disease and stroke statistics—2020 update: A report from the American Heart Association. *Circulation, 141*: e139–e596.

Vitale, M., Masulli, M., Cocozza, S., Anichini, R., Babini, A. C., Boemi, M., Bonora, E., Buzzetti, R., Carpinteri, R., Caselli, C., Ceccarelli, E., Cignarelli, M., Citro, G., Clemente, G., Consoli, A., Corsi, L., De Gregorio, A., Di Bartolo, P., Di Cianni, G., & Fontana, L. (2016). Sex differences in food choices, adherence to dietary recommendations and plasma lipid profile in type 2 diabetes – The TOSCA.IT study. *Nutrition, Metabolism and Cardiovascular Diseases*, *26*(10), 879–885. https://doi.org/10.1016/j.numecd.2016.04.006

Volobueva, A., Zhang, D., Grechko, A. V., & Orekhov, A. N. (2019). Foam cell formation and cholesterol trafficking and metabolism disturbances in atherosclerosis. *Cor et Vasa*, *61*(1), 48–55. https://doi.org/10.1016/j.crvasa.2018.06.006

Wake, H., Takahashi, Y., Yoshii, Y., Gao, S., Mori, S., Wang, D., Teshigawara, K., & Nishibori, M. (2020). Histidine-rich glycoprotein possesses antioxidant activity through self-oxidation and inhibition of hydroxyl radical production via chelating divalent metal ions in Fenton's reaction. *Free Radical Research*, *54*(8-9), 649–661. https://doi.org/10.1080/10715762.2020.1825703

Wan Ahmad, W. A., & Sim, K.-H. (2015). *Annual Report of the NCVD-ACS Registry, 2011-2013*. National Cardiovascular Disease Database (NCVD).

Wan Syahidah, H., Normah, M. & Albert, T. (2014). Protein content and amino acid composition of farmed edible bird's nests in Malaysia. *Malaysian Journal of Veterinary Research*, *5*, 342–346.

Wang, S., Miller, B., Matthan, N. R., Goktas, Z., Wu, D., Reed, D. B., Yin, X., Grammas, P., Moustaid-Moussa, N., Shen, C.-L., & Lichtenstein, A. H. (2013). Aortic cholesterol accumulation correlates with systemic inflammation but not hepatic and gonadal adipose tissue inflammation in low-density lipoprotein receptor null mice. *Nutrition Research*, *33*(12), 1072–1082. https://doi.org/10.1016/j.nutres.2013.09.002

Wang, S., & Smith, J. D. (2014). ABCA1 and nascent HDL biogenesis. *BioFactors*, *40*(6), 547–554. https://doi.org/10.1002/biof.1187

Wang, Y.G. & Yang, T.L. (2015). Liraglutide reduces oxidized LDL-induced oxidative stress and fatty degeneration in Raw 264.7 cells involving the AMPK/SREBP1 pathway. *Journal of Geriatric Cardiology, 12*: 410‒416. http:// doi: 10.11909/j.issn.1671-5411.2015.04.013

Wang, H. H., Garruti, G., Liu, M., Portincasa, P., & Wang, D. Q.-H. (2017). Cholesterol and lipoprotein metabolism and atherosclerosis: Recent advances in reverse cholesterol transport. *Annals of Hepatology*, *16*, S27–S42. https://doi.org/10.5604/01.3001.0010.5495

Wang, C.-Y., Cheng, L.-J., Shen, B., Yuan, Z.-L., Feng, Y.-Q., & Lu, S. (2018a). Antihypertensive and antioxidant properties of sialic acid, the major component of edible bird's nests. *Current Topics in Nutraceutical Research, 17*(4), 376–379. https://doi.org/10.37290/ctnr2641-452x.17:376-379

Wang, B., & Tontonoz, P. (2018b). Liver X receptors in lipid signalling and membrane homeostasis. *Nature Reviews Endocrinology*, *14*(8), 452–463. https://doi.org/10.1038/s41574-018-0037-x

Wang, Y., Branicky, R., Noë, A., & Hekimi, S. (2018c). Superoxide dismutases: Dual roles in controlling ROS damage and regulating ROS signaling. *The Journal of Cell Biology*, *217*(6), 1915–1928. https://doi.org/10.1083/jcb.201708007

Ward, N. C., Watts, G. F., & Eckel, R. H. (2019). Statin toxicity. *Circulation Research*, *124*(2), 328–350. https://doi.org/10.1161/circresaha.118.312782

Weintraub, H. "Simvastatin 80mg: if you can't go lower, go elsewhere," Medscape News, 2011.

Weng, L. C., Lee, N. J., Yeh, W. T., Ho, L. T., & Pan, W. H. (2012). Lower intake of magnesium and dietary fiber increases the incidence of type 2 diabetes in Taiwanese. *Journal of the Formosan Medical Association*, *111*(11), 651–659. https://doi.org/https://doi.org/10.1016/j.jfma.2012.07.038

Whitaker, J. M., Cristol, D. A., & Forsyth, M. H. (2005). Prevalence and genetic diversity of *Bacillus licheniformis* in avian plumage. *Journal of Field Ornithology*, *76*(3), 264–270. https://doi.org/10.1648/0273-8570-76.3.264

WHO. World Health Organization. Cardiovascular disease. (2017). http://www.who.int/mediacentre/factsheets/fs317/en/

WHO. World Health Organization. (2019). *Global health estimates: Leading causes of death*. www.who.int. https://www.who.int/data/gho/data/themes/mortality-and-global-health-estimates/ghe-leading-causes-of-death. [Accessed on 23 October, 2021].

WHO, World Health Organization. (2020). Global health observatory data. Raised Cholesterol. https://www.who.int/data/gho/indicator-metadata-registry/imr-details/3236 [Accessed on 18 February 2021].

WHO, World Health Organization. (2021). Cardiovascular Diseases (CVDs). Who.int; World Health Organization: WHO. https://www.who.int/news-room/fact-sheets/detail/cardiovascular-diseases-(cvds). [Accessed on 11 August, 2021].

Widmer, R. J., Flammer, A. J., Lerman, L. O., & Lerman, A. (2015). The mediterranean diet, its components, and cardiovascular disease. *The American Journal of Medicine*, *128*(3), 229–238. https://doi.org/10.1016/j.amjmed.2014.10.014

Wilkins, T., Tadkod, A., Hepburn, I., & Schade, R. R. (2013). Nonalcoholic fatty liver disease: Diagnosis and management. *American Academy of Family Physicians*, *88*(1), 35–42.

Williams, C.D., Stengel, J., Asike, M.I., Torres, D.M., Shaw, J., Contreras, M., Landt, C.L. and Harrison, S.A. (2011). Prevalence of nonalcoholic fatty liver disease and nonalcoholic steatohepatitis among a largely middle-aged population utilizing ultrasound and liver biopsy: A prospective study. *Gastroenterology,* *140*:124 131. http://dx.doi.org/10.1053/j.gastro.2010.09.038

Williamson, L., & New, D. (2014). How the use of creatine supplements can elevate serum creatinine in the absence of underlying kidney pathology. *BMJ Case Reports*, *2014*. https://doi.org/10.1136/bcr-2014-204754

Wójcik-Cichy, K., Koślińska-Berkan, E., & Piekarska, A. (2018). The influence of NAFLD on the risk of atherosclerosis and cardiovascular diseases. *Clinical and Experimental Hepatology*, *4*(1), 1–6. https://doi.org/10.5114/ceh.2018.7315

Wong, C.-F., Chan, G. K.-L., Zhang, M.-L., Yao, P., Lin, H.-Q., Dong, T. T.-X., Li, G., Lai, X.-P., & Tsim, K. W.-K. (2017). Characterization of edible bird's nest by peptide fingerprinting with principal component analysis. *Food Quality and Safety*, *1*(1), 83–92. https://doi.org/10.1093/fqs/fyx002

Wong, Z. C. F., Chan, G. K. L., Wu, L., Lam, H. H. N., Yao, P., Dong, T. T. X., & Tsim, K. W. K. (2018a). A comprehensive proteomics study on edible bird's nest using new monoclonal antibody approach and application in quality control. *Journal of Food Composition and Analysis*, *66*, 145–151. https://doi.org/10.1016/j.jfca.2017.12.014

Wong, Z. C. F., Chan, G. K. L., Wu, K. Q. Y., Poon, K. K. M., Chen, Y., Dong, T. T. X., & Tsim, K. W. K. (2018b). Complete digestion of edible bird's nest releases free *N*-acetylneuraminic acid and small peptides: An efficient method to improve functional properties. *Food & Function*, *9*(10), 5139–5149. https://doi.org/10.1039/c8fo00991k

Wong, S.F., Lim, P.K.C., Mak, J.W., Ooi, S.S. and Chen, D.K.F. (2018c). Molecular characterization of culturable bacteria in raw and commercial edible bird nests (EBNs). *International Food Research Journal, 25*, 966–974.

Xaplanteris, P., Vlachopoulos, C., Pietri, P., Terentes-Printzios, D., Kardara, D., Alexopoulos, N., Aznaouridis, K., Miliou, A., & Stefanadis, C. (2012). Tomato paste supplementation improves endothelial dynamics and reduces plasma total oxidative status in healthy subjects. *Nutrition Research*, *32*(5), 390–394. https://doi.org/10.1016/j.nutres.2012.03.011

Xiaosheng, S. (2011). Qing Dynasty, "the new Materia Medica" and Modern Herbal Health. New Chinese Medicine 43, 153-154.

Xu, S., Huang, Y., Xie, Y., Lan, T., Le, K., Chen, J., Chen, S., Gao, S., Xu, X., Shen, X., Huang, H., & Liu, P. (2010). Evaluation of foam cell formation in cultured macrophages: an improved method with Oil Red O staining and DiI-oxLDL uptake. *Cytotechnology*, *62*(5), 473–481. https://doi.org/10.1007/s10616-010-9290-0

Xu, X., Lu, L., Dong, Q., Li, X., Zhang, N., Xin, Y., & Xuan, S. (2015). Research advances in the relationship between nonalcoholic fatty liver disease and atherosclerosis. *Lipids in Health and Disease*, *14*(1). https://doi.org/10.1186/s12944-015-0141-z

Xu, F., Yu, H., Lu, C., Chen, J. and Gu, W. (2016). The cholesterol-lowering effect of alisol acetates based on HMG-CoA reductase and its molecular mechanism. *Evidence-Based Complementary and Alternative Medicine, 2016*, 1–11. https://doi.org/10.1155/2016/4753852

Xu, P., Zhai, Y., & Wang, J. (2018). The role of PPAR and its cross-talk with CAR and LXR in obesity and atherosclerosis. *International Journal of Molecular Sciences*, *19*(4), 1260. https://doi.org/10.3390/ijms19041260

Xu, H., Jiang, J., Chen, W., Li, W., & Chen, Z. (2019). Vascular macrophages in atherosclerosis. *Journal of Immunology Research*, *2019*, 1–14. https://doi.org/10.1155/2019/4354786

Yahaya, Y.A. & Don, M.M. (2012). Evaluation of *Trametes lactinea* extracts on the inhibition of hyaluronidase, lipoxygenase and xanthine oxidase activities *in vitro*. *Journal of Physical Science*, *23*(2), 1–15.

Yamamoto, Y., & Gaynor, R. B. (2001). Therapeutic potential of inhibition of the NF-κB pathway in the treatment of inflammation and cancer. *Journal of Clinical Investigation*, *107*(2), 135–142. https://doi.org/10.1172/jci11914

Yang, J., Zhang, L., Yu, C., Yang, X.-F., & Wang, H. (2014). Monocyte and macrophage differentiation: Circulation inflammatory monocyte as biomarker for inflammatory diseases. *Biomarker Research*, *2*(1), 1. https://doi.org/10.1186/2050-7771-2-1

Yang, M., Zhang, Z., Wang, C., Li, K., Li, S., Boden, G., Li, L., & Yang, G. (2012). Nesfatin-1 action in the brain increases insulin sensitivity through Akt/AMPK/TORC2 pathway in diet-induced insulin resistance. *Diabetes, 61*(8), 1959–1968. https://doi.org/10.2337/db11-1755

Yang, S.-T., Kreutzberger, A. J. B., Lee, J., Kiessling, V., & Tamm, L. K. (2016). The role of cholesterol in membrane fusion. *Chemistry and Physics of Lipids*, *199*, 136–143. https://doi.org/10.1016/j.chemphyslip.2016.05.003

Yang, X., Li, Y., Li, Y., Ren, X., Zhang, X., Hu, D., Gao, Y., Xing, Y., & Shang, H. (2017). Oxidative stress-mediated atherosclerosis: mechanisms and therapies. *Frontiers in Physiology*, *8*. https://doi.org/10.3389/fphys.2017.00600

Yang, X., Jia, J., Yu, Z., Duanmu, Z., He, H., Chen, S., & Qu, C. (2020). Inhibition of JAK2/STAT3/SOCS3 signaling attenuates atherosclerosis in rabbit. *BMC Cardiovascular Disorders*, *20*(1). https://doi.org/10.1186/s12872-020-01391-7

Yao, L.H. (2017). Edible-nest swiftlet in flight. LSM4254 - Principles of Taxonomy and Systematics: Species Pages on the Biodiversity of Singapore. https://wiki.nus.edu.sg/display/TAX/Aerodramus+fuciphagus+-+Edible-nest+Swiftlet#Footnote1.

Yao, L.H. (2018). Edible-nest swiftlet on nest. LSM4254 - Principles of Taxonomy and Systematics: Species Pages on the Biodiversity of Singapore. https://wiki.nus.edu.sg/display/TAX/Aerodramus+fuciphagus+-+Edible-nest+Swiftlet#Footnote1.

Yeo, B.-H., Tang, T.-K., Wong, S.-F., Tan, C.-P., Wang, Y., Cheong, L.-Z., & Lai, O.-M. (2021). Potential residual contaminants in edible bird's nest. *Frontiers in Pharmacology*, *12*. https://doi.org/10.3389/fphar.2021.631136

Yew, M. Y., Koh, R. Y., Chye, S. M., Othman, I., & Ng, K. Y. (2014). Edible bird's nest ameliorates oxidative stress-induced apoptosis in SH-SY5Y human neuroblastoma cells. *BMC Complementary and Alternative Medicine*, *14*(1). https://doi.org/10.1186/1472-6882-14-391

Yida, Z., Imam, M. U., & Ismail, M. (2014). *In vitro* bioaccessibility and antioxidant properties of edible bird's nest following simulated human gastro-intestinal digestion. *BMC Complementary and Alternative Medicine*, *14*(1). https://doi.org/10.1186/1472-6882-14-468

Yida, Z., Imam, M. U., Ismail, M., Ismail, N., Azmi, N. H., Wong, W., Altine Adamu, H., Md Zamri, N. D., Ideris, A., & Abdullah, M. A. (2015a). *N*-acetylneuraminic acid supplementation prevents high fat diet-induced insulin resistance in rats through transcriptional and nontranscriptional mechanisms. *BioMed Research International, 2015*, 1–10. https://doi.org/10.1155/2015/602313.

Yida, Z., Imam, M. U., Ismail, M., Wong, W., Abdullah, M. A., Ideris, A., & Ismail, N. (2015b). *N*-acetylneuraminic acid attenuates hypercoagulation on high fat diet-induced hyperlipidemic rats. *Food & Nutrition Research, 59*(1), 29046. https://doi.org/10.3402/fnr.v59.29046

Yida, Z., Imam, M. U., Ismail, M., Hou, Z., Abdullah, M. A., Ideris, A., & Ismail, N. (2015c). Edible bird's nest attenuates high fat diet-induced oxidative stress and inflammation via regulation of hepatic antioxidant and inflammatory genes. *BMC Complementary and Alternative Medicine*, *15*(1). https://doi.org/10.1186/s12906-015-0843-9

Yida, Z., Imam, M. U., Ismail, M., Ismail, N., Ideris, A., & Abdullah, M. A. (2015d). High fat diet-induced inflammation and oxidative stress are attenuated by *N*-acetylneuraminic acid in rats. *Journal of Biomedical Science*, *22*(1). https://doi.org/10.1186/s12929-015-0211-6

Yida, Z., Imam, M. U., Ismail, M., Ooi, D.-J., Sarega, N., Azmi, N. H., Ismail, N., Chan, K. W., Hou, Z., and Yusuf, N. B. (2015e). Edible bird's nest prevents high fat diet-induced insulin resistance in rats. *Journal of Diabetes Research*, 1–11. https://doi.org/10.1155/2015/760535

Yin, Y., Li, Z., Gao, L., Li, Y., Zhao, J., & Zhang, W. (2015). AMPK-dependent modulation of hepatic lipid metabolism by nesfatin-1. *Molecular and Cellular Endocrinology*, *417*, 20–26. https://doi.org/10.1016/j.mce.2015.09.006

You, Y.Y., Li, Z.J., Xu, J., Cao, Y., Cong, P.X. & Xue, C.H. (2012). Analysis of nutritional components in six edible bird's nests. *Acta Pharmacologica Sinica*, *34*(4), 400-402.

You, Y., Cao, Y., Guo, S., Xu, J., Li, Z., Wang, J., & Xue, C. (2014). Purification and identification of α 2–3 linked sialoglycoprotein and α 2–6 linked sialoglycoprotein in edible bird's nest. *European Food Research and Technology*, *240*(2), 389–397. https://doi.org/10.1007/s00217-014-2338-1

Yu, Y.-Q., Gilar, M., Lee, P. J., Bouvier, E. S. P., & Gebler, J. C. (2003). Enzyme-friendly, mass spectrometry-compatible surfactant for in-solution enzymatic digestion of proteins. *Analytical Chemistry*, *75*(21), 6023–6028. https://doi.org/10.1021/ac0346196

Yu, X.H., Fu, Y.C., Zhang, D.W., Yin, K., & Tang, C.K. (2013). Foam cells in atherosclerosis. *Clinica Chimica Acta, 424*, 245–252. https://doi.org/10.1016/j.cca.2013.06.006

Yu, Y.-M., Chao, T.-Y., Chang, W.-C., Chang, M. J., & Lee, M.-F. (2016). Thymol reduces oxidative stress, aortic intimal thickening, and inflammation-related gene expression in hyperlipidemic rabbits. *Journal of Food and Drug Analysis*, *24*(3), 556–563. https://doi.org/10.1016/j.jfda.2016.02.004

Yu, X.-H., Zhang, D.-W., Zheng, X.-L., & Tang, C.-K. (2019). Cholesterol transport system: An integrated cholesterol transport model involved in atherosclerosis. *Progress in Lipid Research*, *73*, 65–91. https://doi.org/10.1016/j.plipres.2018.12.002

Yu, H., Lin, L., Zhang, Z., Zhang, H., & Hu, H. (2020). Targeting NF-κB pathway for the therapy of diseases: mechanism and clinical study. *Signal Transduction and Targeted Therapy*, *5*(1), 1–23. https://doi.org/10.1038/s41392-020-00312-6

Zamora-González, N., Crespo-Sanjuán, J., Calvo-Nieves, M. D., Sánchez, D., Ganfornina, M. D., Martínez, G., Aguirre-Gervás, B., & González-Fajardo, J. A. (2017). Lower expression of genes involved in protection against oxidative stress in symptomatic carotid atherosclerosis. *Annals of Vascular Surgery*, *41*, 271–278. https://doi.org/10.1016/j.avsg.2016.08.031

Zampelas, A., & Magriplis, E. (2019). New insights into cholesterol functions: A friend or an enemy? *Nutrients*, *11*(7), 1645. https://doi.org/10.3390/nu11071645

Zhang, Y., Guo, W., Wen, Y., Xiong, Q., Liu, H., Wu, J., Zou, Y., & Zhu, Y. (2012). SCM-198 attenuates early atherosclerotic lesions in hypercholesterolemic rabbits via modulation of the inflammatory and oxidative stress pathways. *Atherosclerosis*, *224*(1), 43–50. https://doi.org/10.1016/j.atherosclerosis.2012.06.066

Zhang, Y. D., Imam, M. U., Maznah, I., Ismail, N., & Hou, Z. (2015). Edible bird's nest attenuates procoagulation effects of high-fat diet in rats. *Drug Design, Development and Therapy*, 3951. https://doi.org/10.2147/dddt.s87772.

Zhang, Y., Ma, K. L., Ruan, X. Z., & Liu, B. C. (2016). Dysregulation of the low-density lipoprotein receptor pathway is involved in lipid disorder-mediated organ injury. *International journal of biological sciences, 12*(5), 569–579. https://doi.org/10.7150/ijbs.14027

Zhang, L., Zhang, T., Ding, L., Xu, J., Xue, C., Yanagita, T., Chang, Y., & Wang, Y. (2018). The protective activities of dietary sea cucumber cerebrosides against atherosclerosis through regulating inflammation and cholesterol metabolism in male mice. *Molecular Nutrition & Food Research*, *62*(16), 1800315. https://doi.org/10.1002/mnfr.201800315

Zhao, D. (2021). Epidemiological Features of Cardiovascular Disease in Asia. *JACC: Asia*, *1*(1), 1–13. https://doi.org/10.1016/j.jacasi.2021.04.007

Zhao, Y., Yang, Y., Xing, R., Cui, X., Xiao, Y., Xie, L., You, P., Wang, T., Zeng, L., Peng, W., Li, D., Chen, H., & Liu, M. (2018). Hyperlipidemia induces typical atherosclerosis development in LDLR and ApoE deficient rats.

Atherosclerosis, *271*, 26–35. https://doi.org/10.1016/j.atherosclerosis.2018.02.015

Zhiping, H., Mustapha Umar, I., Maznah, I., Nur Hanisah, A., Norsharina, I., Aini, I., & Rozi, M. (2015a). Lactoferrin and ovotransferrin contribute toward antioxidative effects of edible bird's nest against hydrogen peroxide-induced oxidative stress in human SH-SY5Y cells. *Bioscience, Biotechnology, and Biochemistry*, *79*(10), 1570–1578. https://doi.org/10.1080/09168451.2015.1050989

Zhiping, H., Imam, M. U., Ismail, M., Ismail, N., Yida, Z., Ideris, A., Sarega, N., & Mahmud, R. (2015b). Effects of edible bird's nest on hippocampal and cortical neurodegeneration in ovariectomized rats. *Food & Function*, *6*(5), 1701–1711. https://doi.org/10.1039/c5fo00226e

Zhou, X., Yang, S., Yang, G., Tan, Z., & Guan, F. (2019). Two-step derivatization and mass spectral distinction of α2,3 and α2,6 sialic acid linkages on *N*-glycans by MALDI-TOF. *Chinese Chemical Letters, 30*(3), 676–680. https://doi.org/10.1016/j.cclet.2018.12.016

Zhu, R., Ou, Z., Ruan, X., & Gong, J. (2012). Role of liver X receptors in cholesterol efflux and inflammatory signaling (Review). *Molecular Medicine Reports, 5*(4), 895–900. https://doi.org/10.3892/mmr.2012.758

Zinellu, A., & Mangoni, A. A. (2021). A systematic review and meta-analysis of the effect of statins on glutathione peroxidase, superoxide dismutase, and catalase. *Antioxidants*, *10*(11), 1841. https://doi.org/10.3390/antiox10111841

Zou, Y.H., Zhao, L., Xu, Y.K., Bao, J.M., Liu, X., Zhang, J.S., Li, W., Ahmed, A., Yin, S. and Tang, G.H. (2018). Anti-inflammatory sesquiterpenoids from the traditional Chinese medicine *Salvia plebeia*: Regulates pro-inflammatory mediators through inhibition of NF-kappaB and Erk1/2 signaling pathways in LPS-induced RAW 264.7 cells. *Journal of Ethnopharmacology, 210,* 95–106.

Zukefli, S. N., Chua, L. S., & Rahmat, Z. (2016). Protein extraction and identification by gel electrophoresis and mass spectrometry from edible bird's nest samples. *Food Analytical Methods*, *10*(2), 387–398. https://doi.org/10.1007/s12161-016-0590-7

Zulkifli, D.A., Mansor, R., Md-Ajat, M.M., Abas, F., Ideris, A. and Abu, J. (2019). Differentiation of Malaysian farmed and commercialized edible bird's nests through nutritional composition analysis. *Journal of Tropical Agricultural Science, 42*, 871–888.