KYOLIC ARTICLE

SUMMARY

Potent Blood Pressure Reduction
Combats Arterial Stiffness
Reverses Blood Vessel Aging
Reduces Lipid Oxidation
Decreases Cholesterol
Helps Prevent Blood Thickening
Improves Gut Microbiome Composition

WHAT IS IT?

The medicinal properties of garlic have been known for centuries, with antifungal, antibacterial, antioxidation, detoxification, tumour suppression and the prevention of heart disease as some of the well-established benefits of garlic ingestion/supplementation. Hippocrates, widely known as the "father of medicine," prescribed garlic to treat wounds, fight infection, and ease digestive disorders. In relation to heart disease, garlic has been evidenced to improve blood cholesterol profiles and decrease blood coagulability.

"Kyolic" garlic is and aged garlic extract wherein garlic is harvested, cleaned, and sliced before being placed in specialized stainless steel containers where it is aged without heat for up to 20 months. The extract is then filtered and concentrated at low temperature, resulting in the following compositional changes (Table 1):

	Incubation time (months)				
Compound	**0**	**1**	**3**	**12**	**24**
	(mg/g dry extract)				
γ-Glutamyl-S-allylcysteine	12.7	5.8	1.1	0	0
S-Allylcysteine	**0.2**	**5.9**	**7.2**	**7.1**	**7.2**
γ-Glutamyl-S-1-propenylcysteine	15.9	3.4	0.5	0	0
S-1-Propenylcysteine	0.5	6.7	8.1	6.5	4.4
S-Allylmercaptocysteine	0.01	0.6	1.2	1.7	1.9

Table 1: Compositional changes in Kyolic Garlic during 24 months of aging (adapted from Colin-Gonzalez *et al.*)[2]

S-allyl cysteine (SAC) is the dominant constituent and is the chemical upon which extracts are

standardised to, hence why Strom's garlic is Kyolic; in the same way that you can expect the same amount of withanolides in your KSM-66 Ashwagandha (also the only Ashwagandha used in Strom products), you can expect the same quantities of SAC in every capsule, of every tub of Kyolic Garlic (KG). Other - even more ludicrously-named - compounds are also made during the aging process such as tetrahydro-beta-carbolines (1-methyl-1,2,3,4-tetrahydro-beta-carboline-3-carboxylic acid and 1-methyl-1,2,3,4-tetrahydro-beta-carboline-1,3-dicarboxylic acid) as well as Nα-(1-deoxy-D-fructos-1-yl)-L-arginine, that all contribute to Kyolic's awesomesauce[2].

Overall, these compounds confer KG's exceptionally beneficial effects on heart health.

WHAT DOES IT DO?

BLOOD PRESSURE

Kyolic Garlic significantly reduced blood pressure in a large proportion (70–80%) of hypertensive patients, with effects similar in magnitude to first-line standard antihypertensive medications, and has shown promise in reducing both peripheral AND central blood pressure (a better predictor of cardiovascular risk)[20].

One double-blind randomized placebo-controlled parallel 12-week trial found that adults with uncontrolled hypertension [systolic BP (SBP) >140 mmHg and/or diastolic BP (DBP) >90 mmHg] given 1.2 g Kyolic Garlic extract (standardised to 1.2 mg S-allylcysteine) daily for 12 weeks saw a significant reduction in both systolic (10 mmHg) and diastolic (5.4 mmHg) blood pressure compared to placebo[20]. Subgroup analysis of participants taking standard BP medication revealed a slightly greater reduction in systolic blood pressure (SBP) by 12.3 mmHg when compared to those not taking BP medications. More importantly, 83% of the participants responded to Kyolic with SBP reductions of > 5 mmHg, indicating the mean results were not skewed by extreme responders. Most interestingly, subgroup analysis of participants taking standard BP medication (n = 16/17) revealed a slightly greater reduction in systolic blood pressure of 12.3 ± 4.7 mmHg compared with participants not on BP medication (n = 7/9) of 4.9 ± 5.4 mmHg ($p = 0.014$)[20].

A meta-analysis including 12 trials and 553 adults with high blood pressure examined the effects of Kyolic on hypertension and found that Kyolic Garlic lowered SBP on average by 8.3 ± 1.9 mmHg and DBP by 5.5 ± 1.9 mmHg. This meta-analysis found the same conclusions as the above study on subgroups already taking blood pressure medications - Kyolic's effects were independent of and additive and the total risk of cardiovascular disease reduction was 16-40%[21].

Another meta-analysis including 20 trials and more than 900 participants revealed a significant effect of KG on blood pressure, with an average decrease in systolic blood pressure of 8.6 mmHg systolic and 6.1 mmHg diastolic in hypertensives[22].

Taken collectively, the reductions in BP observed in the Kyolic Garlic treated patients is comparable with conventional blood pressure drug therapies, reducing the risk of cardiovascular disease (e.g. heart attack or stroke) by 30–40%[14]. That is pretty, fucking, cool.

CHOLESTEROL

A meta-analysis of 39 trials and 2,300 participants demonstrated an improvement in total cholesterol (−17 ± 6 mg/dL) and low-density-lipoprotein (LDL - 9 ± 6 mg/dL) in adults with slightly elevated (>200 mg/dL, >5.5 mmol/L) levels at baseline[3] when taken for >2 months[23]. While this 8% reduction may seem small, the clinical significance has been associated with a 38% risk reduction in coronary events at age 50 y[24-25]. Several papers have also noted an increase in HDL-C ("good" cholesterol) following KG supplementation[4,23]. The underlying mechanism may be via decreased HMG CoA reductase activity - a rate limiting enzyme in cholesterol biosynthesis[5].

Cholesterol is essential for normal body functions that include preserving the integrity of cell membranes, facilitating cell signaling, maintaining the myelin sheath, and synthesizing steroid hormones, vitamin D, and coenzyme Q10. In some patients, inhibition of cholesterol synthesis with statin drugs (current standard pharmacologic treatment for cholesterol) interferes with these essential pathways, resulting in detrimental side effects including myalgia (muscle pain), muscle weakness, neuropathy, cognitive impairment, mood disorders, anxiety, and an increased risk of diabetes[26-30]. Thus, the moderate reduction in cholesterol concentrations conferred by garlic supplementation may provide an alternative therapeutic agent with a higher safety profile than statins in patients with slightly elevated cholesterol.

DISCLAIMER: DON'T DITCH YOUR STATINS WITHOUT CONSENT FROM YOUR GP!

Another study conducted in rabbits fed a cholesterol-supplemented diet (i.e. they were deliberately fed high amounts of cholesterol) saw that Kyolic Garlic supplementation reduced the surface area of the thoracic aorta covered by fatty streaks by 64%[31]. This study also found that KG supplementation reduced the development of thickened, lipid-filled lesions in the right carotid arteries of the cholesterol-fed rabbits.

What is a "fatty streak"? The best description would be it being the earliest visible lesion of atherosclerosis, which occurs due to an accumulation of lipid-laden (lipids = cholesterol & triglycerides) foam cells in the intimal layer of the artery. When lipid levels accumulate - and various other proatherogenic factors - in our blood, an innate immune response is triggered, resulting in the recruitment of immune cells to the subendothelial space to participate in plaque formation. Some of these immune cells differentiate into macrophages, which then engulf excess cholesterol and form "foam cells", which accumulate and form a fatty streak (Figure 1).

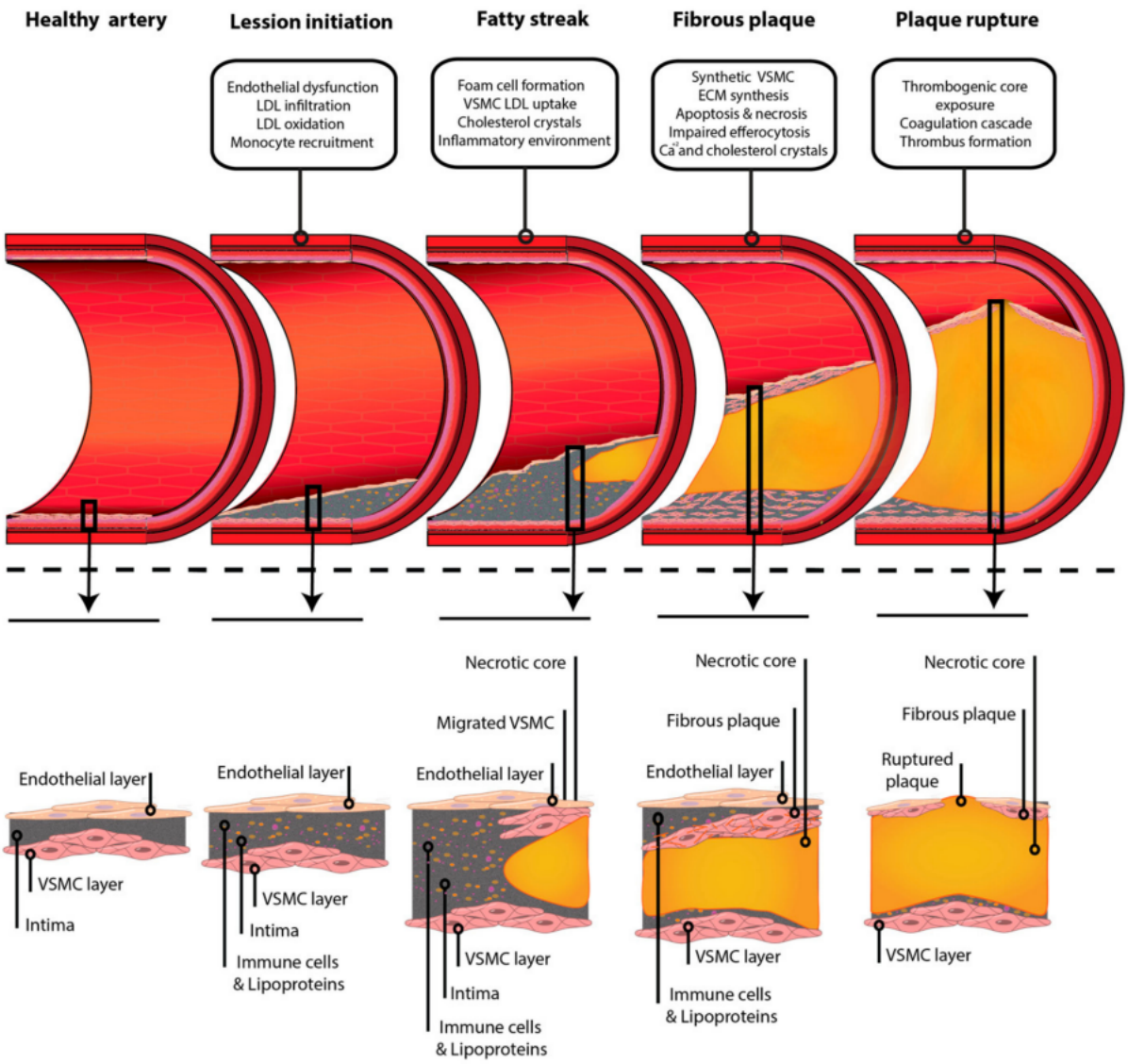

Figure 1: Schematic of atheroma plaque formation from a healthy artery to plaque rupture (adapted from Jebari-Benslaiman *et al.*)[1]

Over time, the fatty streak evolves into a fibrous plaque - the hallmark of established atherosclerosis - where ultimately, the lesion may accumulate large amounts of lipid. If these lipid-laden lesions become unstable, plaque rupture may occur, potentially occluding the overlying artery and resulting in a heart attack or stroke[1].

There does seem to be some indication that the greatest effects on cholesterol reduction occur during longer term (>2 months) administrations of KG. Thus, it would be pragmatic to keep KG in your arsenal of cardiovascular "dailies", as a prophylactic, as opposed to circumstantial usage to combat specific health consequences (such as the administration of TUDCA during periods of oral steroid deployment).

ANTIOXIDANT CAPACITY

Reactive oxygen species (ROS) are important drivers of inflammation. Despite it being important for tissue repair, immune function and adaptation to stress, inflammation gets a bad rap, but normal levels of inflammation are essential for maintaining homeostasis and survival. However, excess ROS can produce a state of oxidative stress which modifies LDL to its oxidized form (oxLDL). Platelets can also be activated by oxLDL and induce vascular inflammation[6,7]. Eventually, oxLDL, together with chronic low-grade inflammation resulting from endothelial injury, trigger an innate immune response and increase the recruitment of immune cells within blood vessels as described above.

oxLDL cholesterol has been extensively associated with plaque formation and increased risk of heart attack and stroke when accumulated in the endothelium[8]. The oxidation of LDL cholesterol may be generated by free radicals through dietary factors, such as consumption of trans fats, deep-fried foods, smoking, or the presence of high blood sugar - permabulkers, I'm looking at you![9]

Kyolic Garlic has an exceptional antioxidant capacity, where it has been extensively associated with the prevention or amelioration of oxidative stress. SAC contains a thiol group responsible for its antioxidant capacity, which effectively neutralizes reactive oxygen species (ROS). SAC readily prevents lipid[10-12] and protein oxidation by scavenging superoxide anion (O2•−), hydrogen peroxide (H2O2), hydroxyl radical (OH•), peroxynitrite radical (ONOO−), peroxyl radical (LOO•), hypochlorous acid (HOCl) and singlet oxygen (1O2) (Figure 2 - blue lines).

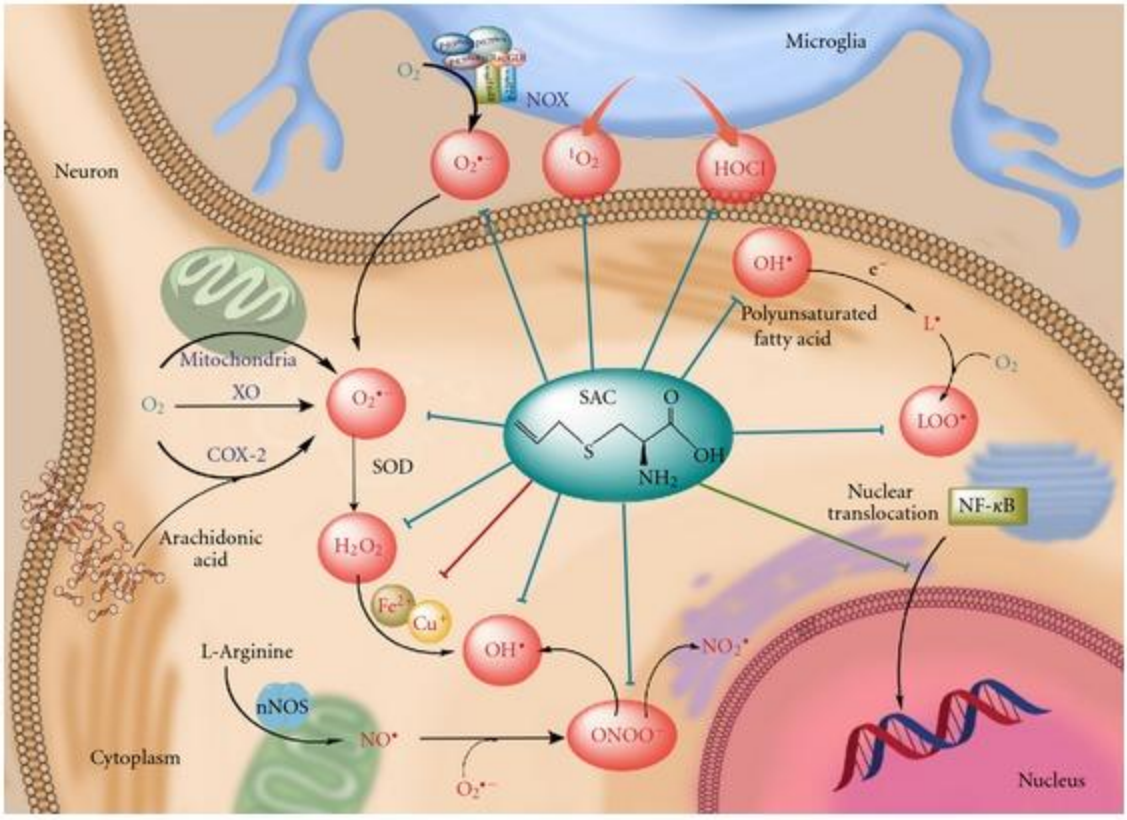

Figure 2: Antioxidant mechanisms of S-allylcysteine (SAC). Blue Lines: scavenging of reactive oxygen species (ROS), Red Line: chelating actions, Green Line: inhibition (adapted from Colin-Gonzalez *et al.*)[2]

SAC chelates (mops up) Fe2+ and Cu2+ (prooxidants), preventing them from forming excessive ROS during the Fenton reaction. SAC increases glutathione levels and enhances catalase and glutathione peroxidase activities in both the kidney and liver[13]. Kyolic Garlic and SAC activates key regulators of the expression of antioxidant genes such as Nrf2, as well as decreasing the expression and/or activities of prooxidant enzymes such as COX-2 and NADPH oxidase[2]. Additionally, lipids are an integral component of cell membranes, wherein peroxidation of these lipids can have deleterious consequences leading to dysfunction and cell death. ROS drive peroxidation of membrane-associated lipids[15], wherein quenching of these excessive ROS by KG administration extends the protective capacity of KG even further.

This is a very brief summary of the protective antioxidant capacity of Kyolic Garlic. For a more comprehensive review of these mechanisms, I strongly recommend reading the 2012 publication by Colín-González et al.[2].

BLOOD THINNING

Kyolic aged garlic extract has demonstrated to be able to normalize blood thickness. The blood thinning effect of garlic, of any type, is well known, decreasing the risk of blood clotting and thrombosis. Garlic is thought to interfere with platelet function by altering thromboxane production, preventing degranulation and interfering with the binding of fibrinogen with glycoprotein IIa/IIIa[16].

Additionally, in contrast to *raw* garlic, coadministration of KG with blood thinning medication Warfarin did not result in any significant difference to the risk of bleeding, suggesting KG is safe to use with other blood thinning medications (at least Warfarin)[17].

ARTERIAL STIFFNESS & ENDOTHELIAL FUNCTION

The ability of blood vessels to constrict (narrow) and dilate (widen) - their "elasticity" - is critical to healthy cardiovascular function. Arterial stiffness, an indicator of the loss of elasticity or hardening of the arteries, increases with age through loss of intact elastin and collagen fibers in the arterial wall, leading to atherosclerosis and contributing to increased BP[1]. Blood vessel elasticity decreases with age by an average of 1.43 m/s pulse wave velocity (PWV - a standard technique for measuring arterial stiffness) every 10 years. Additionally, anabolic steroid abuse has also been shown to potentiate vessel elasticity loss[18-19]. 12 weeks of Kyolic Garlic supplementation resulted in a PWV reduction of 0.7 m/s, thereby reducing arterial aging by ~5 years[20]. Because blood traveling through more elastic vessels takes a longer time, a decrease in PWV also corresponds with an improvement in vascular elasticity.

These findings were in line with an earlier study where firefighters (high psychological and occupational stress lifestyles are well-known cardiovascular disease risk factors [shameless SupportMax Neuro plug] given 1.2 g of Kyolic Garlic and 120 mg Coenzyme Q10 for 1 year saw a reduction in PWV of 1.2 m/s when compared with the placebo group[32]. This study also showed a mean increase in area under the temperature curve (TMP-AUC) - a well-established index of endothelial function - of 31.28. An increase in TMP-AUC, which corresponds to faster temperature rebound response after induced ischemia, is a marker of improved endothelial function. This provides strong evidence of an improvement in vascular elasticity (PWV) and endothelial functions

(TMP-AUC), respectively.

GUT MICROBIOME

Another nifty little property of KG is its beneficial impact on gut microbiota. Stool analysis revealed an increase in microbial richness, diversity, and a shift toward a healthier Firmicutes-to-Bacteroidetes ratio in the KG versus placebo group. The KG group saw an increase in Lactobacillus and Clostridia species, whereas in the placebo group, an increase in F. prausnitzii to the detriment of *Lactobacillus* and *Clostridia* species was noted. *Lactobacillus* bacteria are generally regarded as beneficial[33], while colonization of the gut with *Clostridia* species have been found to activate specific immune genes in intestinal epithelial cells, preventing the sensitization to food allergens in mice[34-35]. In the placebo group the observed marked increase in *F. prausnitzii* might have been influenced by the fiber-rich cellulose in the placebo capsules. Cellulose, generally regarded as inert, may have been food for growth for bacterial species thriving on dietary fiber, such as the Firmicute *Butyrivibria crossus*[36-37].

Additionally, chemical analyses have found oxidized LDL-C to consist of many different components, suggesting multiple origins, potentially including those from pathogens and their associated toxins[38]. Thus, the positive effects of garlic on maintaining a healthy microbiome may add to its cardioprotective capacities.

HOW DO I TAKE IT?

1.2 g Kyolic (standardised to 1.2 mg S-allylcysteine) daily are the recommended study dosages. Strom Kyolic Garlic contains 750 mg per capsule or 1.5 g per recommended serving - because #neversettle - so our standard serving should be more than sufficient.

GOES WELL WITH

ThromboMax
LipidMax
SystolMax

With the length of this reference list and this article taking 3-4 hours to write - I can't be bothered to write any other conclusion than "buy Kyolic Garlic".

REFERENCES

1. Jebari-Benslaiman, S., Galicia-García, U., Larrea-Sebal, A., Olaetxea, J. R., Alloza, I., Vandenbroeck, K., Benito-Vicente, A., & Martín, C. (2022). Pathophysiology of Atherosclerosis. International journal of molecular sciences, 23(6), 3346. https://doi.org/10.3390/ijms23063346
2. Colín-González AL, Santana RA, Silva-Islas CA, Chánez-Cárdenas ME, Santamaría A, Maldonado PD. The antioxidant mechanisms underlying the aged garlic extract- and S-allylcysteine-induced protection. Oxid Med Cell Longev. 2012;2012:907162. doi: 10.1155/2012/907162. Epub 2012 May 17. PMID: 22685624; PMCID: PMC3363007.
3. Ried, K., Toben, C., & Fakler, P. (2013). Effect of garlic on serum lipids: an updated meta-analysis. Nutrition reviews, 71(5), 282–299. https://doi.org/10.1111/nure.12012
4. Lau, B. H., Lam, F., & Wang-Cheng, R. (1987). Effect of an odor-modified garlic preparation on blood

lipids. Nutrition Research, 7(2), 139-149.
5. Gebhardt R. (1991). Inhibition of cholesterol biosynthesis by a water-soluble garlic extract in primary cultures of rat hepatocytes. Arzneimittel-Forschung, 41(8), 800–804.
6. Liu, W., Yin, Y., Zhou, Z., He, M., & Dai, Y. (2014). OxLDL-induced IL-1 beta secretion promoting foam cells formation was mainly via CD36 mediated ROS production leading to NLRP3 inflammasome activation. Inflammation research : official journal of the European Histamine Research Society ... [et al.], 63(1), 33–43. https://doi.org/10.1007/s00011-013-0667-3
7. Daub, K., Seizer, P., Stellos, K., Krämer, B. F., Bigalke, B., Schaller, M., Fateh-Moghadam, S., Gawaz, M., & Lindemann, S. (2010). Oxidized LDL-activated platelets induce vascular inflammation. Seminars in thrombosis and hemostasis, 36(2), 146–156. https://doi.org/10.1055/s-0030-1251498
8. Willcox, J. K., Catignani, G. L., & Lazarus, S. (2003). Tomatoes and cardiovascular health. Critical reviews in food science and nutrition, 43(1), 1–18. https://doi.org/10.1080/10408690390826437
9. Willcox, J. K., Ash, S. L., & Catignani, G. L. (2004). Antioxidants and prevention of chronic disease. Critical reviews in food science and nutrition, 44(4), 275–295. https://doi.org/10.1080/10408690490468489
10. Ide, N., Matsuura, H. and Itakura, Y. (1996), Scavenging Effect of Aged Garlic Extract and its Constituents on Active Oxygen Species. Phytother. Res., 10: 340-341. https://doi.org/10.1002/(SICI)1099-1573(199606)10:4<340::AID-PTR831>3.0.CO;2-4
11. Yamasaki, T., Li, L. and Lau, B.H.S. (1994), Garlic compounds protect vascular endothelial cells from hydrogen peroxide-induced oxidant injury. Phytother. Res., 8: 408-412. https://doi.org/10.1002/ptr.2650080706
12. Ide, N., & Lau, B. H. (1997). Garlic compounds protect vascular endothelial cells from oxidized low density lipoprotein-induced injury. The Journal of pharmacy and pharmacology, 49(9), 908–911. https://doi.org/10.1111/j.2042-7158.1997.tb06134.x
13. Hsu CC, Huang CN, Hung YC, Yin MC. Five cysteine-containing compounds have antioxidative activity in Balb/cA mice. Journal of Nutrition. 2004;134(1):149–152
14. Lewington S, Clarke R, Qizilbash N, Peto R, Collins R. Age-specific relevance of usual blood pressure to vascular mortality: a meta-analysis of individual data for one million adults in 61 prospective studies. Lancet (2002) 360:1903–13. doi: 10.1016/S0140-6736(02)11911-8
15. 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
16. Rahman K. (2007). Effects of garlic on platelet biochemistry and physiology. Molecular nutrition & food research, 51(11), 1335–1344. https://doi.org/10.1002/mnfr.200700058
17. Macan, H., Uykimpang, R., Alconcel, M., Takasu, J., Razon, R., Amagase, H., & Niihara, Y. (2006). Aged garlic extract may be safe for patients on warfarin therapy. The Journal of nutrition, 136(3 Suppl), 793S–795S. https://doi.org/10.1093/jn/136.3.793S
18. Rasmussen, J. J., Schou, M., Madsen, P. L., Selmer, C., Johansen, M. L., Hovind, P., Ulriksen, P. S., Faber, J., Gustafsson, F., & Kistorp, C. (2018). Increased blood pressure and aortic stiffness among abusers of anabolic androgenic steroids: potential effect of suppressed natriuretic peptides in plasma?. Journal of hypertension, 36(2), 277–285. https://doi.org/10.1097/HJH.0000000000001546
19. Melsom, H. S., Heiestad, C. M., Eftestøl, E., Torp, M. K., Gundersen, K., Bjørnebekk, A. K., Thorsby, P. M., Stensløkken, K. O., & Hisdal, J. (2022). Reduced arterial elasticity after anabolic-androgenic steroid use in young adult males and mice. Scientific reports, 12(1), 9707. https://doi.org/10.1038/s41598-022-14065-5
20. Ried, K., Travica, N., & Sali, A. (2018). The Effect of Kyolic Aged Garlic Extract on Gut Microbiota, Inflammation, and Cardiovascular Markers in Hypertensives: The GarGIC Trial. Frontiers in nutrition, 5,

122. https://doi.org/10.3389/fnut.2018.00122
21. Ried K. (2016). Garlic Lowers Blood Pressure in Hypertensive Individuals, Regulates Serum Cholesterol, and Stimulates Immunity: An Updated Meta-analysis and Review. The Journal of nutrition, 146(2), 389S–396S. https://doi.org/10.3945/jn.114.2021921
22. Ried K. (2020). Garlic lowers blood pressure in hypertensive subjects, improves arterial stiffness and gut microbiota: A review and meta-analysis. Experimental and therapeutic medicine, 19(2), 1472–1478. https://doi.org/10.3892/etm.2019.8374
23. Ried, K., Toben, C., & Fakler, P. (2013). Effect of garlic on serum lipids: an updated meta-analysis. Nutrition reviews, 71(5), 282–299. https://doi.org/10.1111/nure.12012
24. Law, M. R., Wald, N. J., & Thompson, S. G. (1994). By how much and how quickly does reduction in serum cholesterol concentration lower risk of ischaemic heart disease?. BMJ (Clinical research ed.), 308(6925), 367–372. https://doi.org/10.1136/bmj.308.6925.367
25. Wald, N. J., & Law, M. R. (1995). Serum cholesterol and ischaemic heart disease. Atherosclerosis, 118 Suppl, S1–S5.
26. Preiss, D., & Sattar, N. (2011). Statins and the risk of new-onset diabetes: a review of recent evidence. Current opinion in lipidology, 22(6), 460–466. https://doi.org/10.1097/MOL.0b013e32834b4994
27. Sattar, N., Preiss, D., Murray, H. M., Welsh, P., Buckley, B. M., de Craen, A. J., Seshasai, S. R., McMurray, J. J., Freeman, D. J., Jukema, J. W., Macfarlane, P. W., Packard, C. J., Stott, D. J., Westendorp, R. G., Shepherd, J., Davis, B. R., Pressel, S. L., Marchioli, R., Marfisi, R. M., Maggioni, A. P., ... Ford, I. (2010). Statins and risk of incident diabetes: a collaborative meta-analysis of randomised statin trials. Lancet (London, England), 375(9716), 735–742. https://doi.org/10.1016/S0140-6736(09)61965-6
28. Golomb, B. A., & Evans, M. A. (2008). Statin adverse effects : a review of the literature and evidence for a mitochondrial mechanism. American journal of cardiovascular drugs : drugs, devices, and other interventions, 8(6), 373–418. https://doi.org/10.2165/0129784-200808060-00004
29. Tatley, M., & Savage, R. (2007). Psychiatric adverse reactions with statins, fibrates and ezetimibe: implications for the use of lipid-lowering agents. Drug safety, 30(3), 195–201. https://doi.org/10.2165/00002018-200730030-00003
30. 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
31. Efendy, J. L., Simmons, D. L., Campbell, G. R., & Campbell, J. H. (1997). The effect of the aged garlic extract, 'Kyolic', on the development of experimental atherosclerosis. Atherosclerosis, 132(1), 37–42. https://doi.org/10.1016/s0021-9150(97)00078-6
32. Larijani, V. N., Ahmadi, N., Zeb, I., Khan, F., Flores, F., & Budoff, M. (2013). Beneficial effects of aged garlic extract and coenzyme Q10 on vascular elasticity and endothelial function: the FAITH randomized clinical trial. Nutrition (Burbank, Los Angeles County, Calif.), 29(1), 71–75. https://doi.org/10.1016/j.nut.2012.03.016
33. Slavin J. (2013). Fiber and prebiotics: mechanisms and health benefits. Nutrients, 5(4), 1417–1435. https://doi.org/10.3390/nu5041417
34. Stefka AT, Feehley T, Tripathi P, Qiu J, McCoy K, Mazmanian SK, et al. Commensal bacteria protect against food allergen sensitization. Proc Natl Acad Sci USA. (2014) 111:13145–50. doi:10.1073/pnas.1412008111
35. Feehley T, Stefka AT, Cao S, Nagler CR. Microbial regulation of allergic responses to food. Semin Immunopathol. (2012) 34:671–88. doi: 10.1007/s00281-012-0337-5
36. Chung WSF, Walker AW, Louis P, Parkhill J, Vermeiren J, Bosscher D, et al. Modulation of the human gut microbiota by dietary fibres occurs at the species level. BMC Biol. (2016) 14:3. doi: 10.1186/s12915-015-0224-3
37. Flint HJ, Scott KP, Duncan SH, Louis P, Forano E. Microbial degradation of complex carbohydrates

in the gut. Gut Microb. (2012) 3:289–306. doi: 10.4161/gmic.19897
38. Parthasarathy, S., Raghavamenon, A., Garelnabi, M. O., & Santanam, N. (2010). Oxidized low-density lipoprotein. Methods in molecular biology (Clifton, N.J.), 610, 403–417. https://doi.org/10.1007/978-1-60327-029-8_24