Health effect research development on sea-buckthorn fruit pulp

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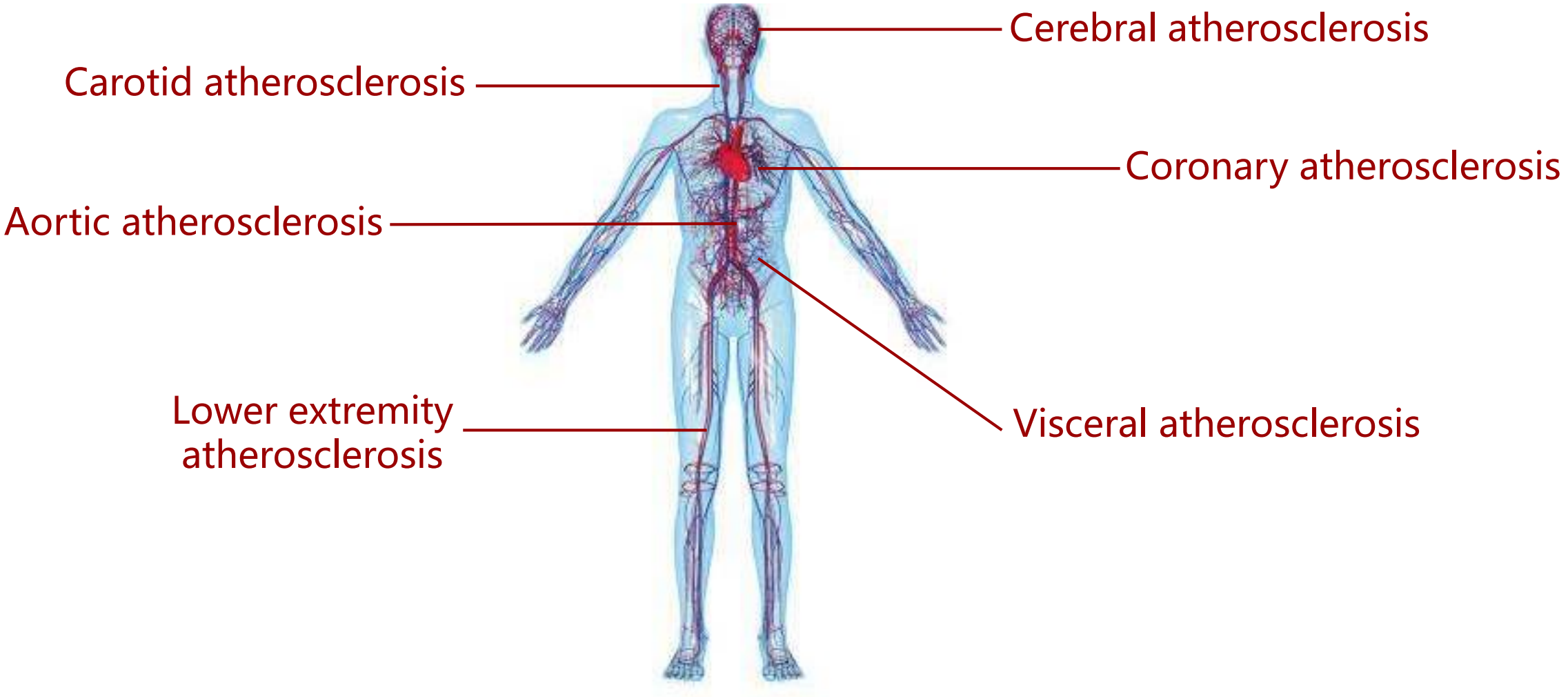
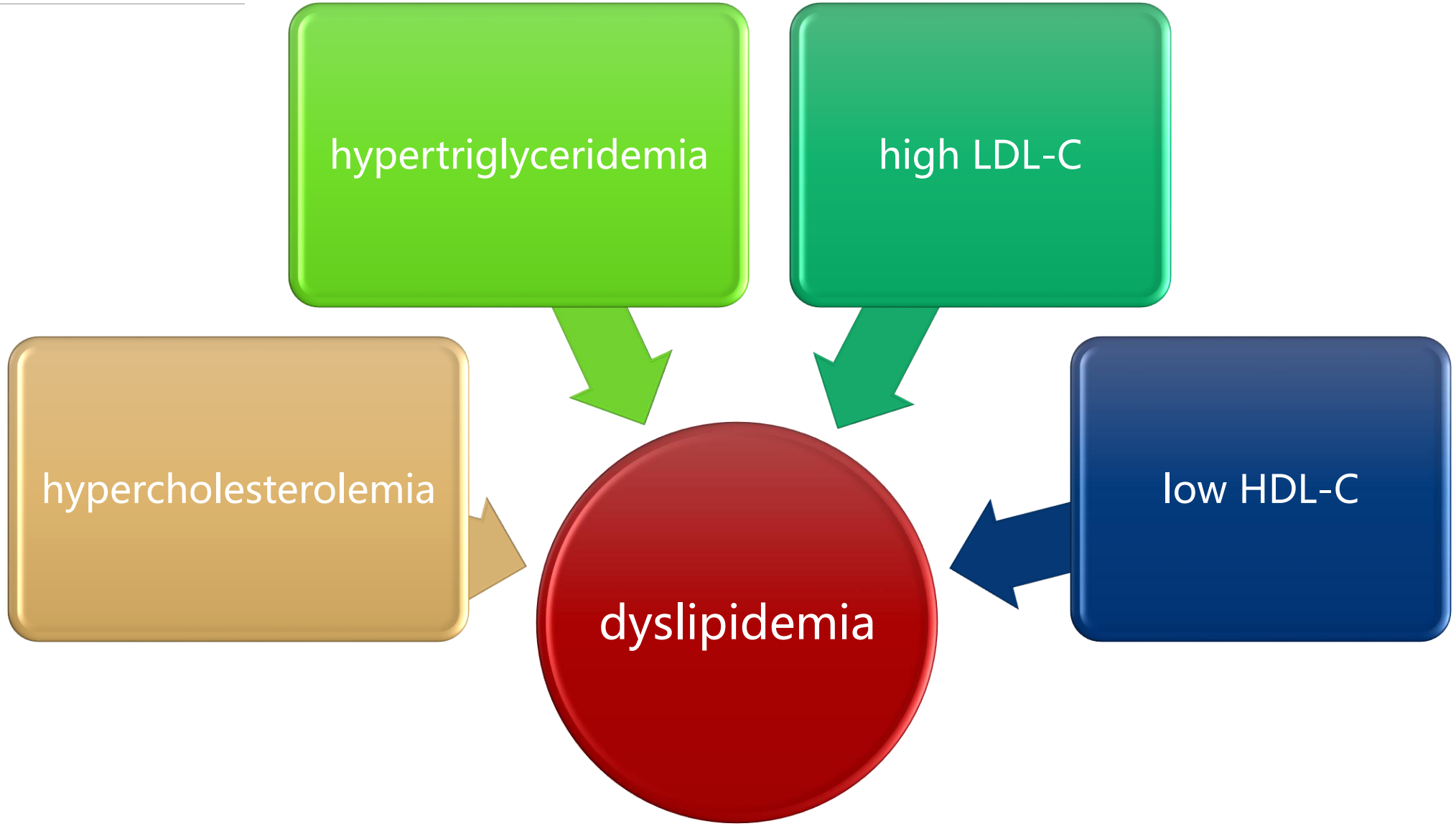
Background

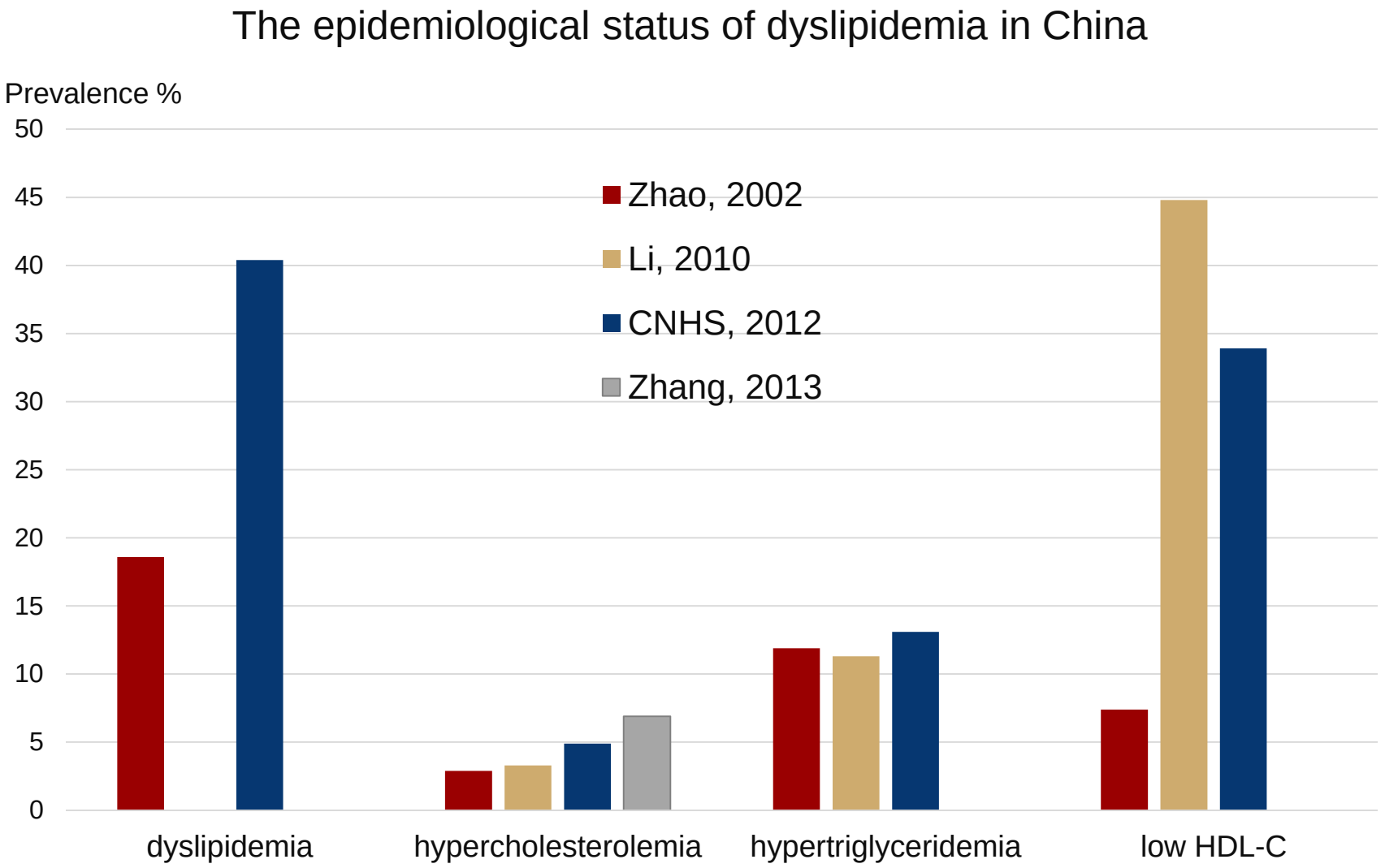


The main hazards of dyslipidemia

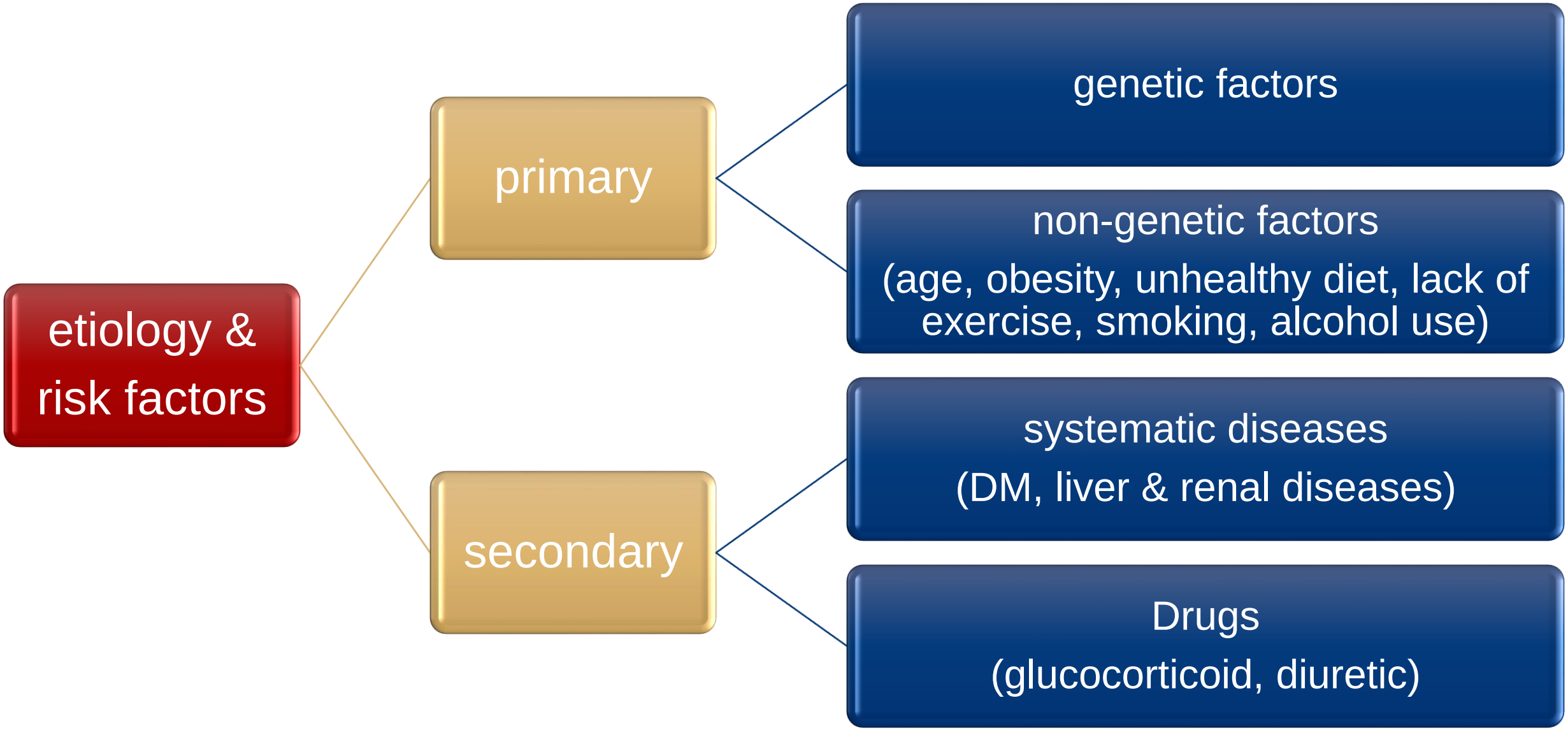
Background


hypertriglyceridemia
high LDL-C
hypercholesterolemia
low HDL-C
dyslipidemia

研究背景


The epidemiological status of dyslipidemia in China
Prevalence %
50
45
40
35
30
25
20
15
10
5
0
Zhao, 2002
Li, 2010
CNHS, 2012
Zhang, 2013
dyslipidemia
hypercholesterolemia
hypertriglyceridemia
low HDL-C

Background


etiology & risk factors
primary
secondary
genetic factors
non-genetic factors
(age, obesity, unhealthy diet, lack of exercise, smoking, alcohol use)
systematic diseases
(DM, liver & renal diseases)
Drugs
(glucocorticoid, diuretic)

Background——gut microbiota & lipid metabolism

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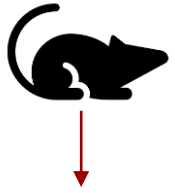
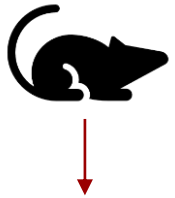
Animal experiment

ApoE-/--deficient mice

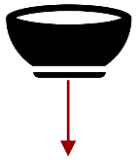
germ-free conditions

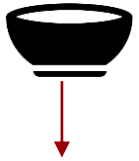




conventional conditions with defined microflora

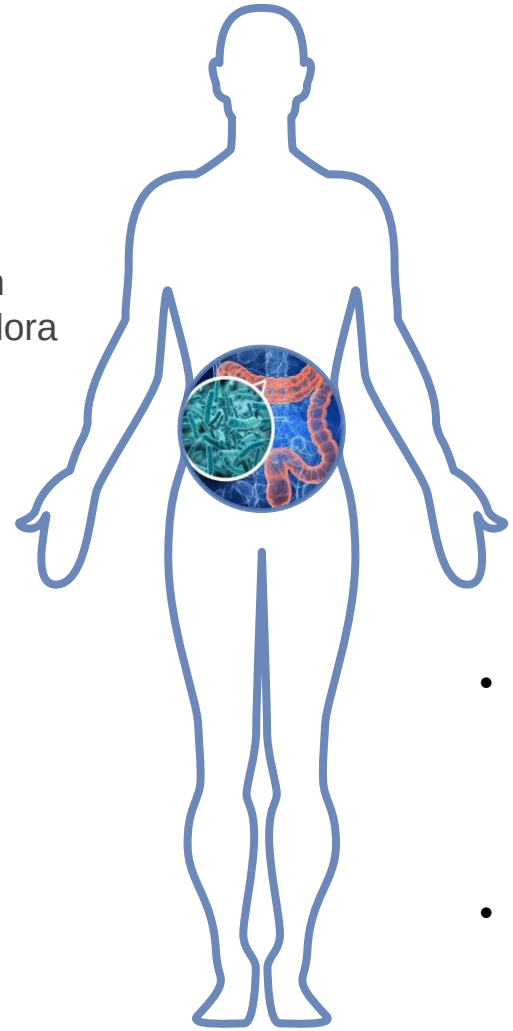
low cholesterol standard diet



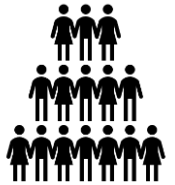


atherosclerotic plaques in the aorta

absence of atherosclerotic plaques



Population study



893 subjects from cohort

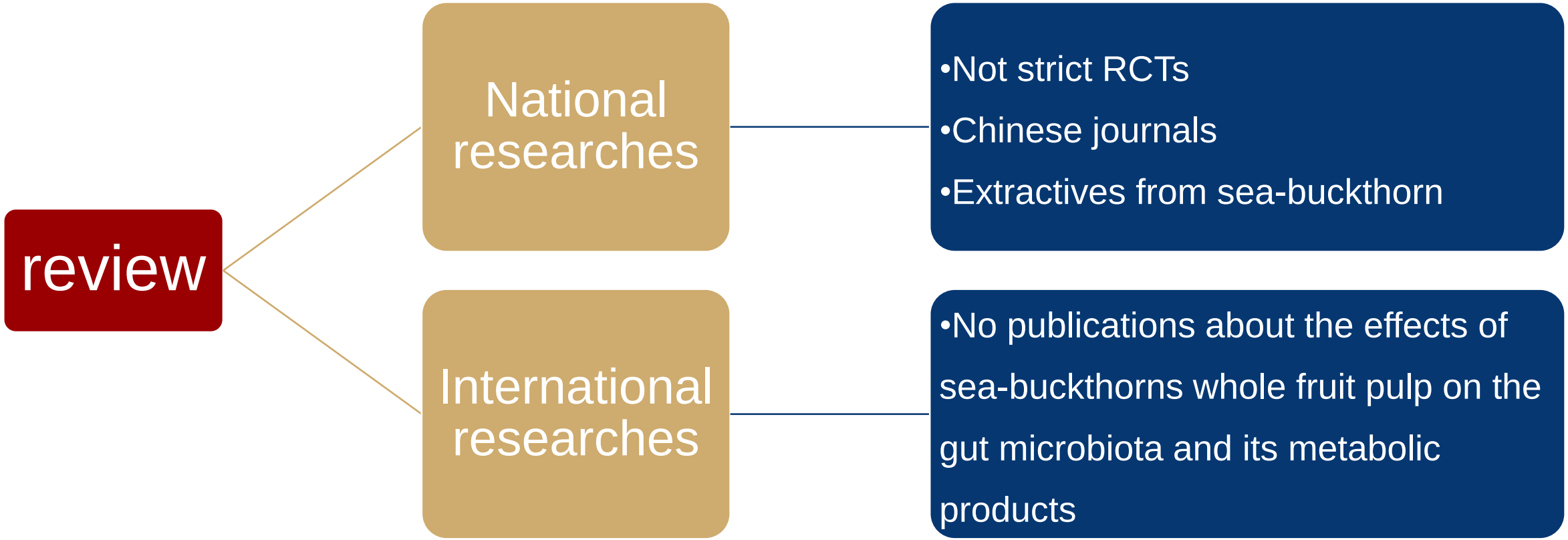
16sRNA

- The gut microbiome may play an important role in the variation in body mass index and blood lipid levels, independent of age, sex, and host genetics.
- The potential of therapies altering the gut microbiome to control BMI, triglycerides, and HDL.

*Stepankova R , Tonar Z , Bartova J , et al. Absence of Microbiota (Germ-Free Conditions) Accelerates the Atherosclerosis in ApoE-Deficient Mice Fed Standard Low Cholesterol Diet[J]. Journal of Atherosclerosis and Thrombosis, 2010, 17(8):796-804.

*Fu J , Bonder M J , María Carmen Cenit, et al. The Gut Microbiome Contributes to a Substantial Proportion of the Variation in Blood Lipids[J]. Circulation Research, 2015, 117(9):817-824.

Background


review
National researches
•Not strict RCTs
•Chinese journals
•Extractives from sea-buckthorn
International researches
•No publications about the effects of sea-buckthorns whole fruit pulp on the gut microbiota and its metabolic products

Objectives

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01 To explore the dynamic effects of sea-buckthorns whole fruit pulp on blood lipids in patients with hypercholesterolemia.

02 To explore the mechanism of action of sea-buckthorns whole fruit pulp on the gut microbiota and metabolic product changes in patients with hypercholesterolemia.

Methods

randomized, double-blind, controlled trial → follow-up → data

334 → screening → 111

Control group -55: 90g

Sea-buckthorns group-56: 90g

follow-up: 0 day; 45 days; 90 days

data:
- Diet —3d24h & FFQ) Physical activities Sleep
- Body measurements
- Blood samples analysis
- Fecal samples analysis

Hippophae rhamnoides L. subsp. Sinensis

- NSFC-81472969
- IRB00001052-17052
- ChiCTR1800014406

Methods

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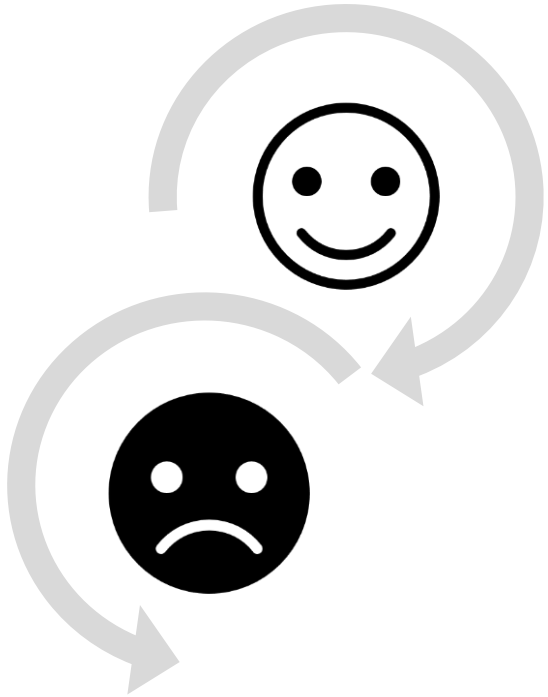
Exclusion criteria

- People with thyroid, kidney, and blood-related diseases;
- People with abnormal liver function;
- Non-menopausal women;
- Diabetics;
- People who have suffered from myocardial infarction or are receiving cardiovascular drug treatment;
- People with gastrointestinal dysfunction;
- People taking lipid-lowering drugs;
- People with infectious diseases (such as tuberculosis, viral hepatitis, and HIV infection);
- People with mental illness and memory impairment;
- People who cannot answer questions correctly, etc.

Subjects with hypercholesterolemia

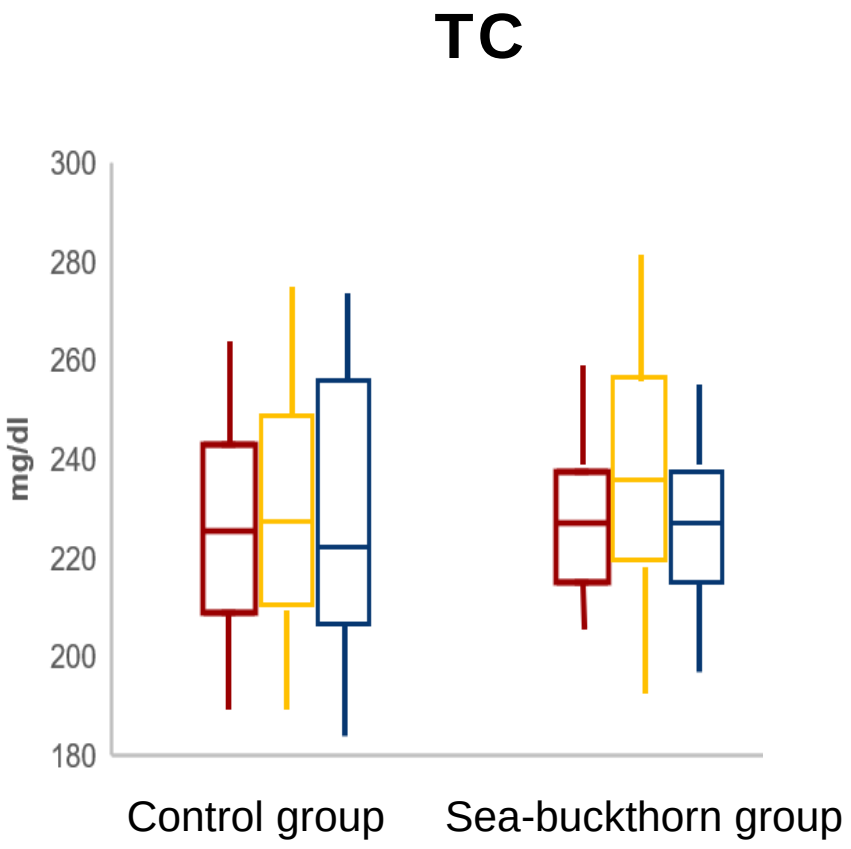


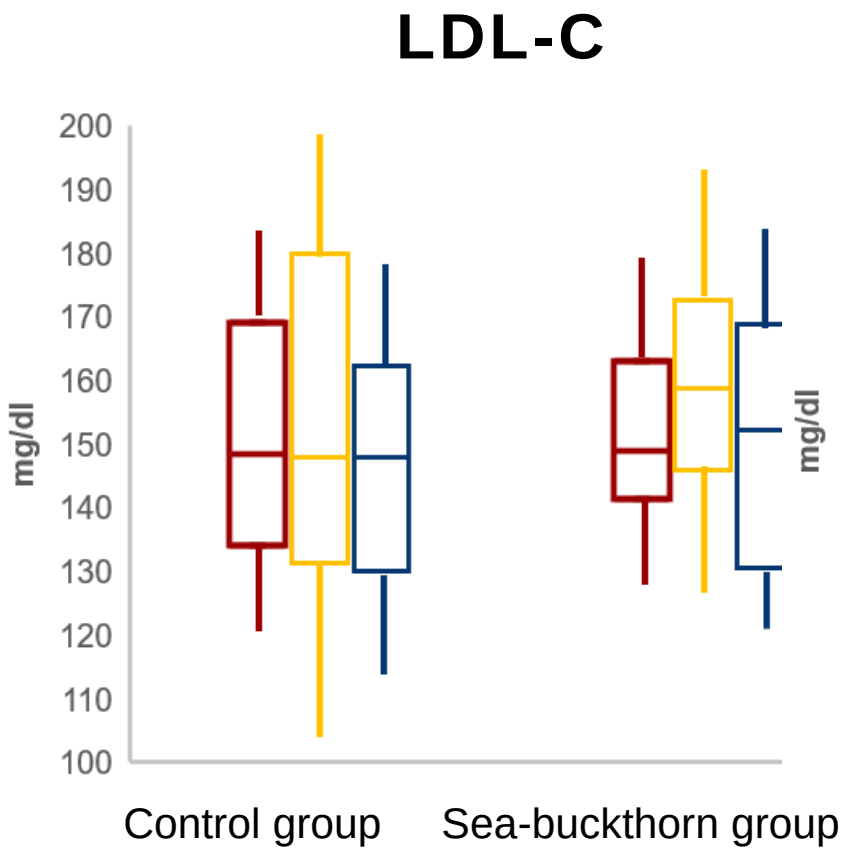
Inclusion criteria

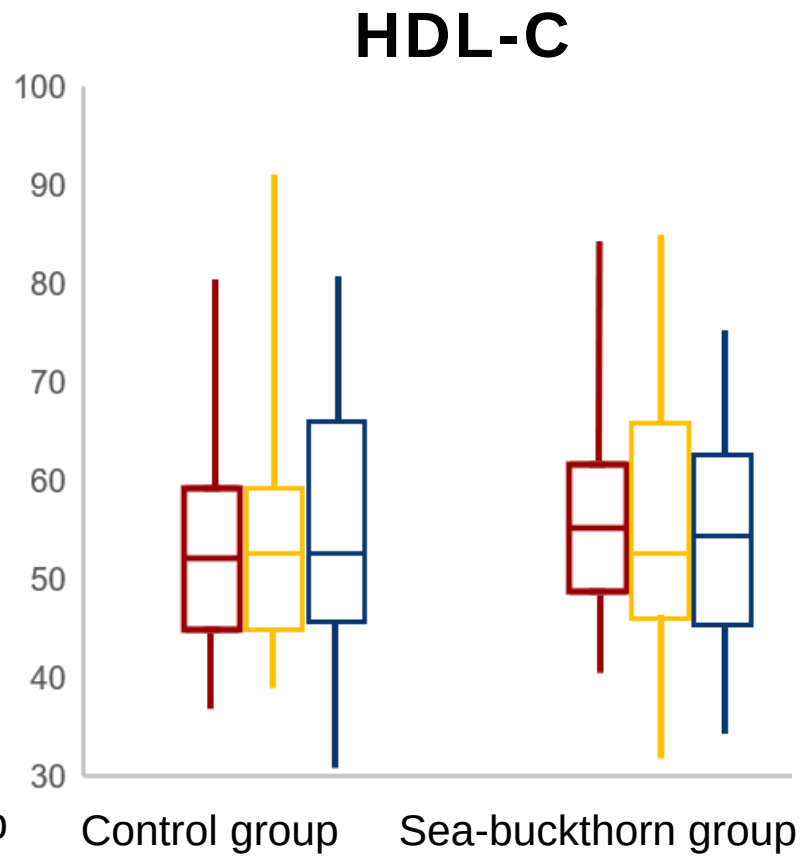
- Age 50-70 years old, both genders are acceptable, and women should be postmenopausal;
- 5.2mmol/L ≤ TC ≤ 7.2mmol/L;
- Insulin < 25mU/L;
- Blood pressure < 160/99mmHg;
- Hemoglobin > 120g/L;
- Thyroid-stimulating hormone 0.3~4.2mU/L;
- Alanine aminotransferase < 60U/L;
- Creatinine < 115μmol/L.

Results

- **After 90 days intervention，there were no significant effects on blood lipids.**

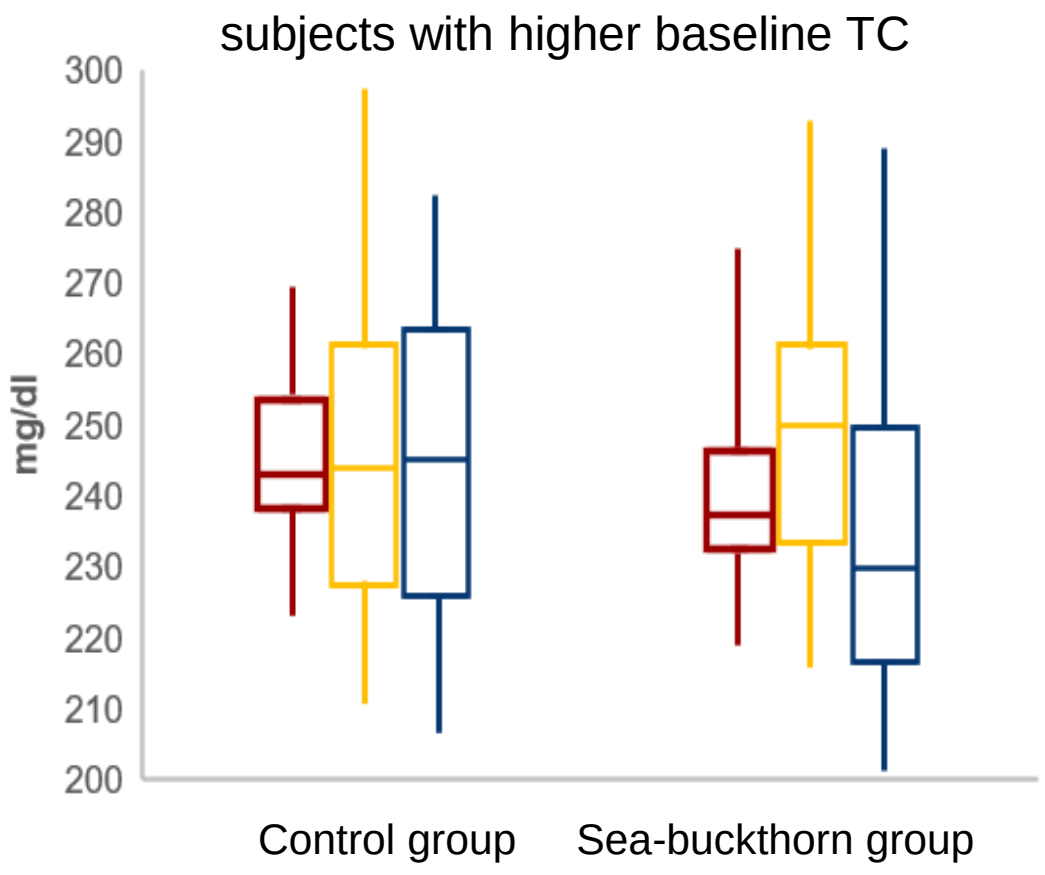


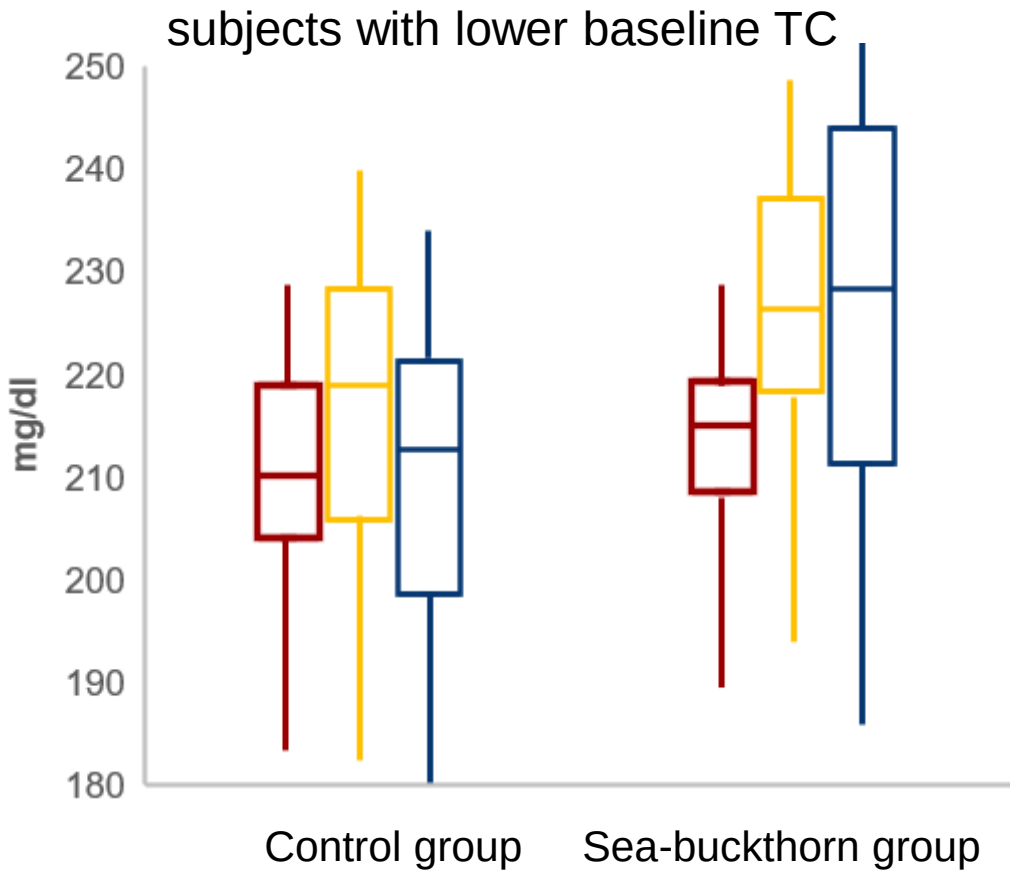




Results

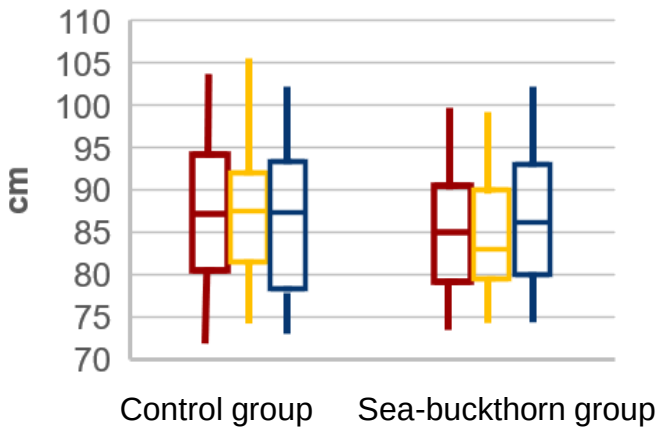
- **Stratified analysis showed that sea buckthorn intervention reduced TC levels in subjects with higher baseline TC.**



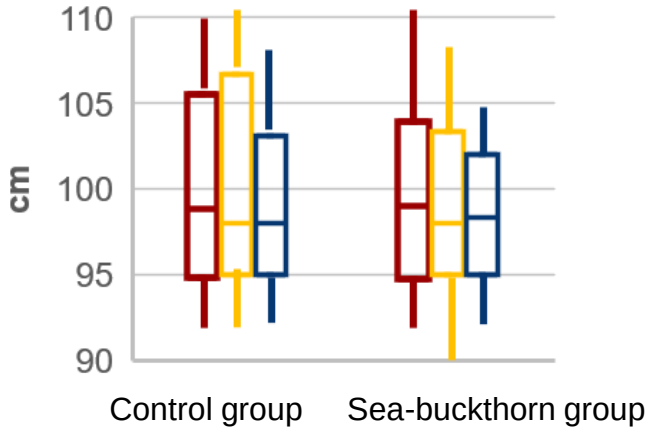


Results

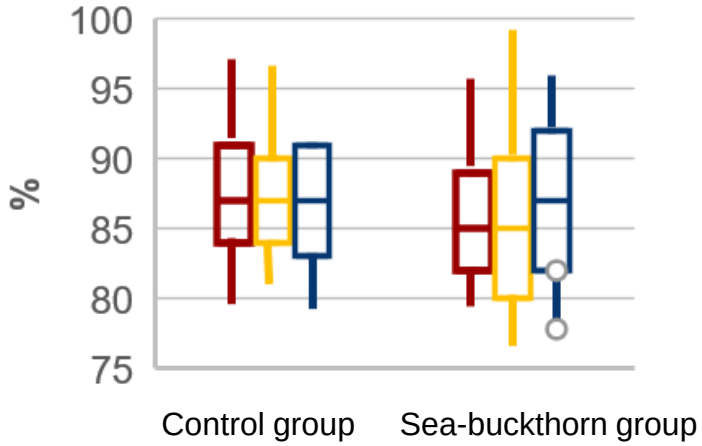
waist circumference



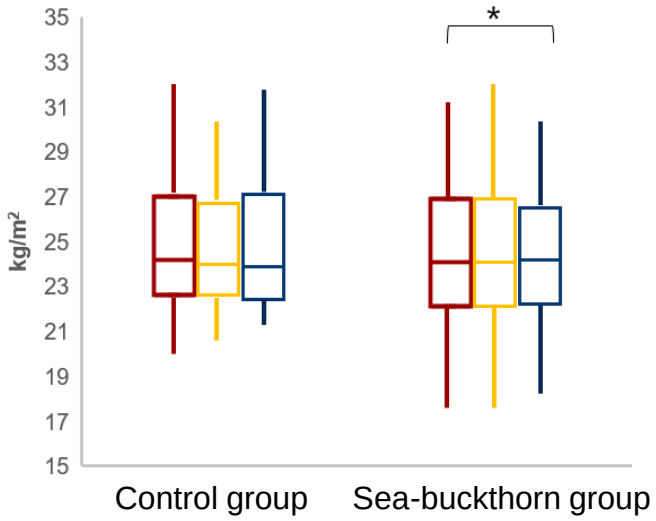
hip circumference



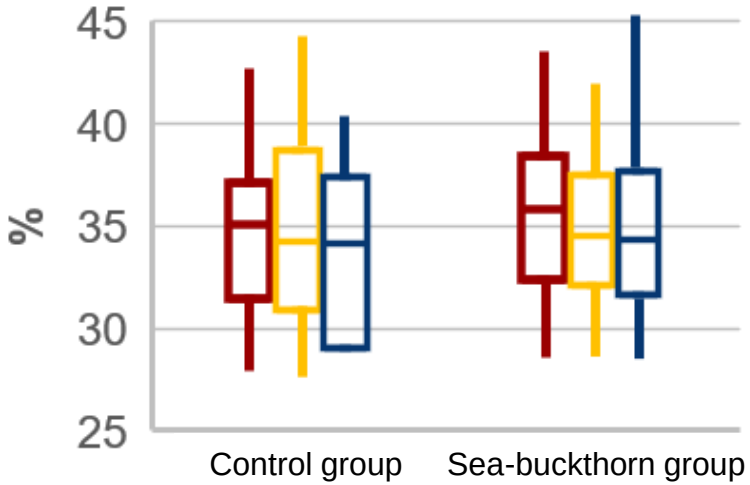
waist / hip



BMI

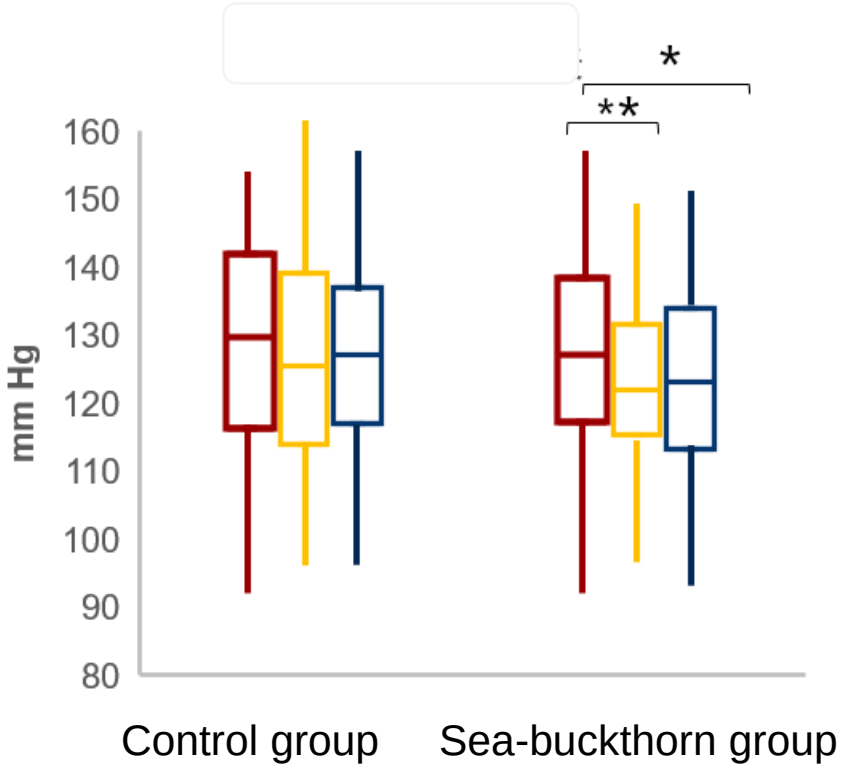


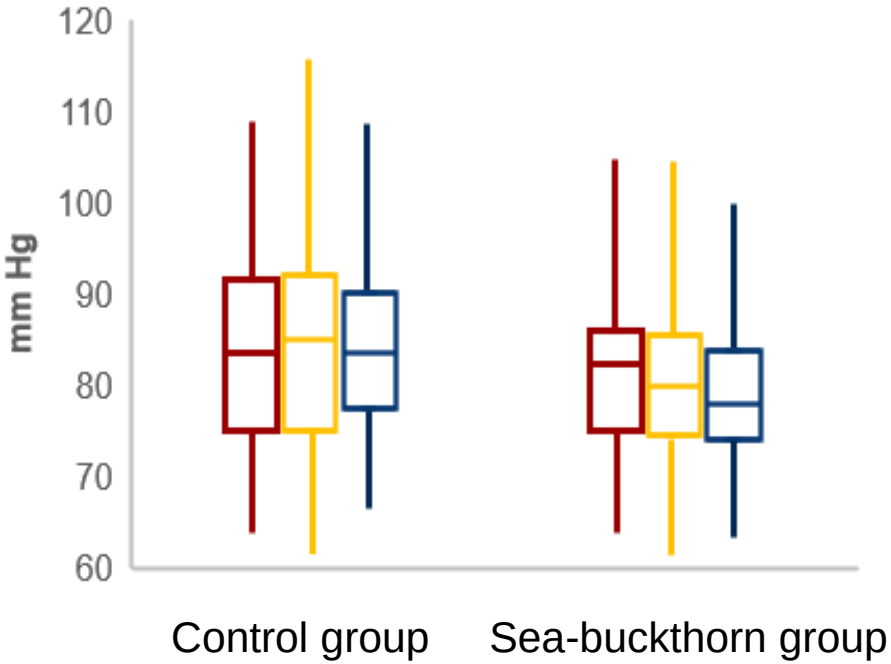
body fat rate



Results

- **Systolic blood pressure was reduced, and diastolic blood pressure showed a downward trend.**





Results

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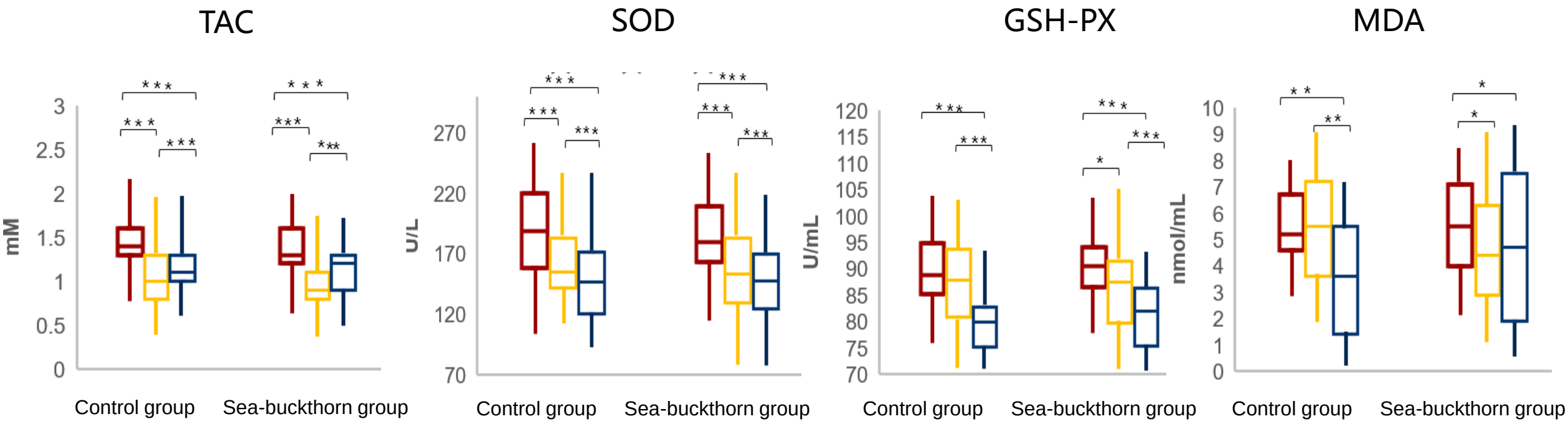
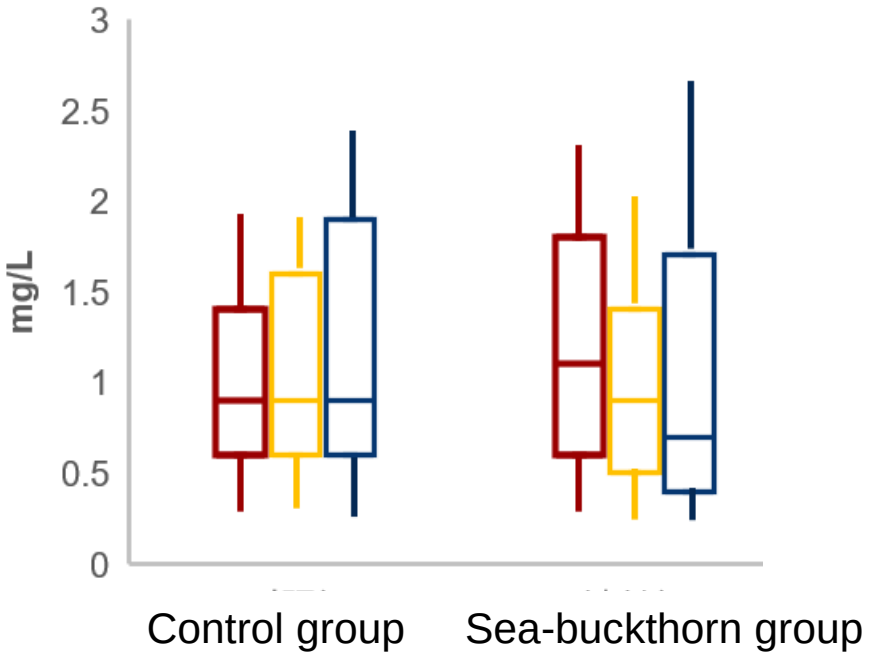
- **There were no significant effects on antioxidants between groups.**



Results

- The level of serum inflammatory factors was **reduced** to a certain extent, especially **hsCRP** decreased significantly.



Results

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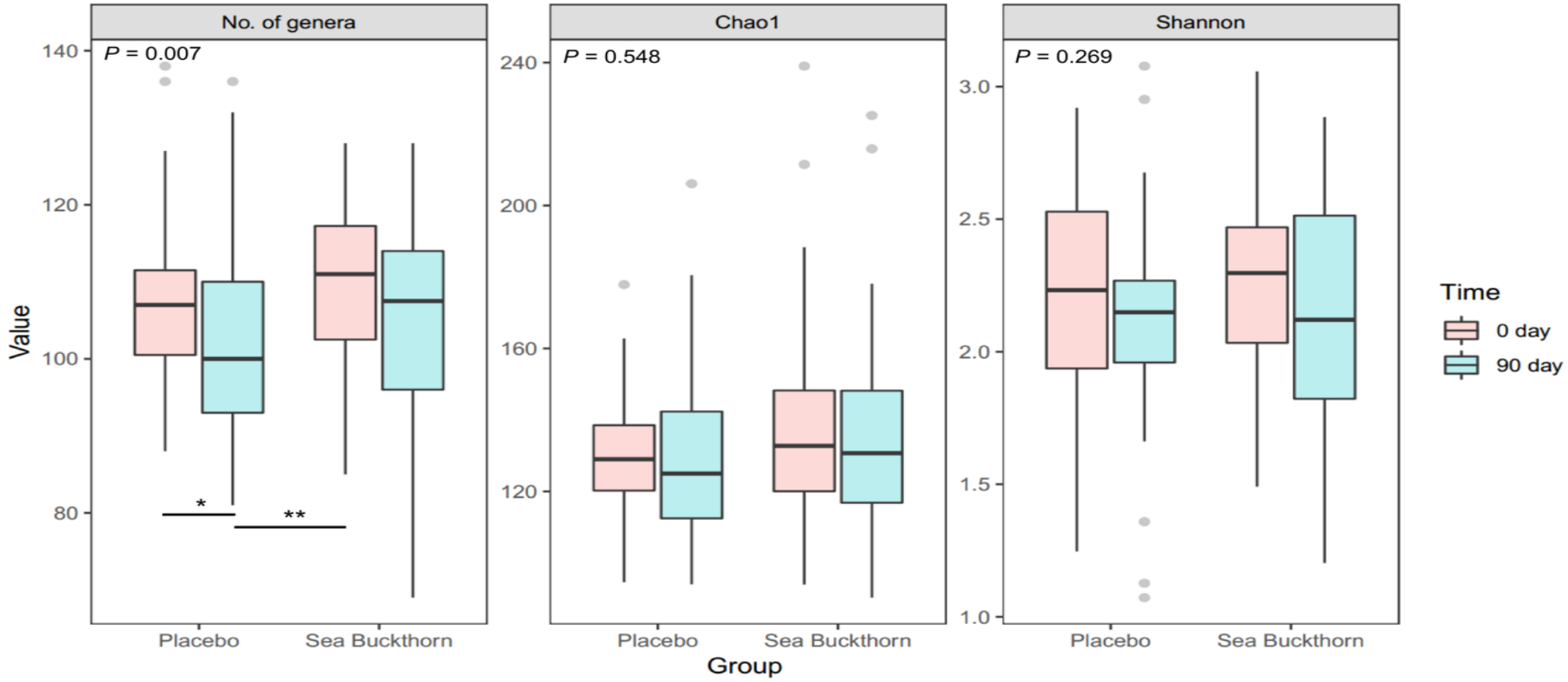
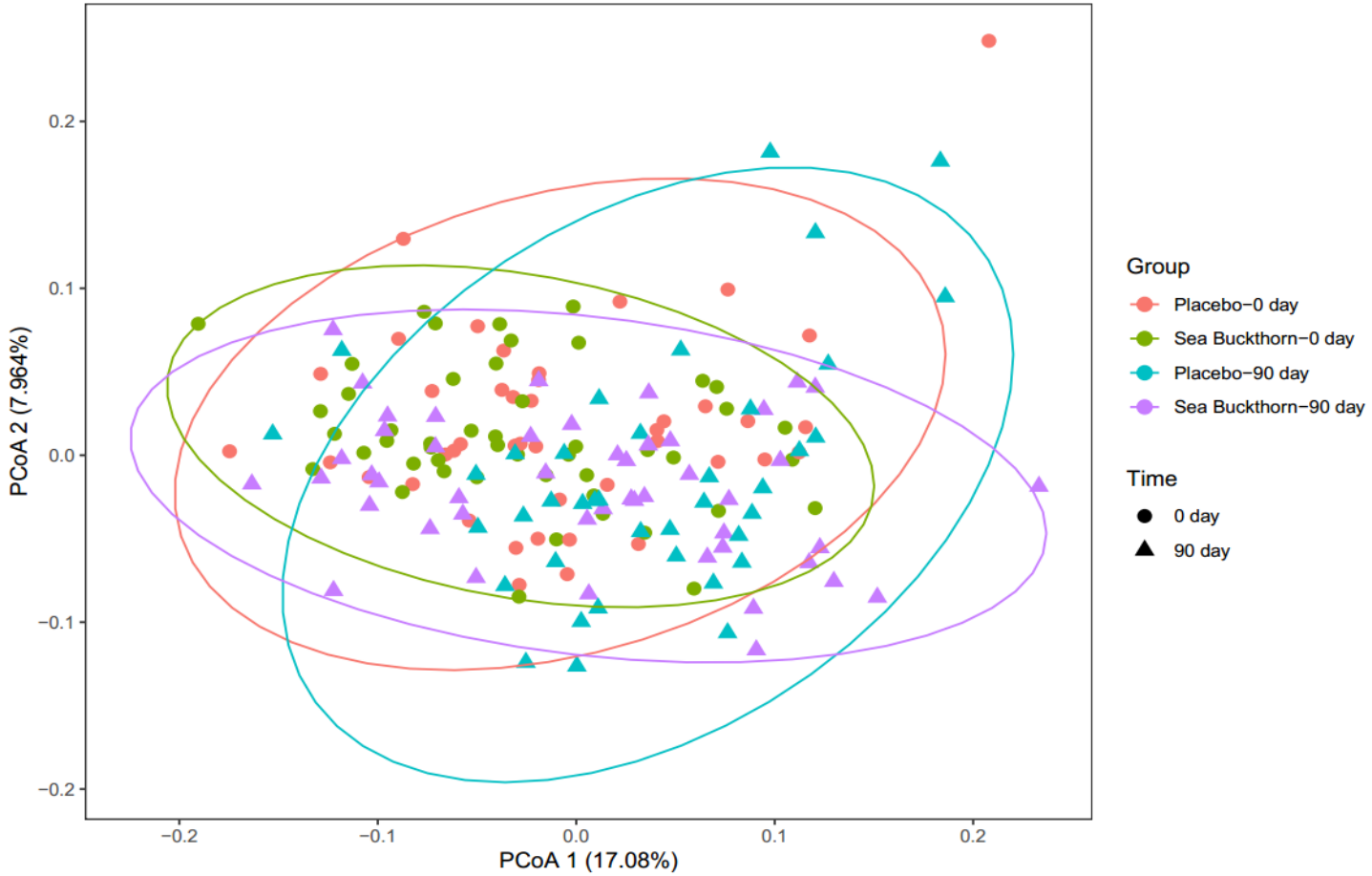
- There were no significant changes in **α diversity** in terms of species diversity.



Results

- There were significant changes in **β diversity** in terms of species diversity.



between groups: P=0.017

within S group: P=0.045

Results

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Butyric acid-producing bacteria

- *Blautia*
- *unclassified_Ruminococcaceae*
- *Faecalibacterium*
- *Sporobacte*
- *Butyrivibrio*
- *Coprococcus*

Positively correlated with antioxidants

Negatively correlated with IL-6

Pathogenic bacteria

- *Fusicatenibacter*
- *Odoribacter*

Positively correlated with hsCRP & TC

Results

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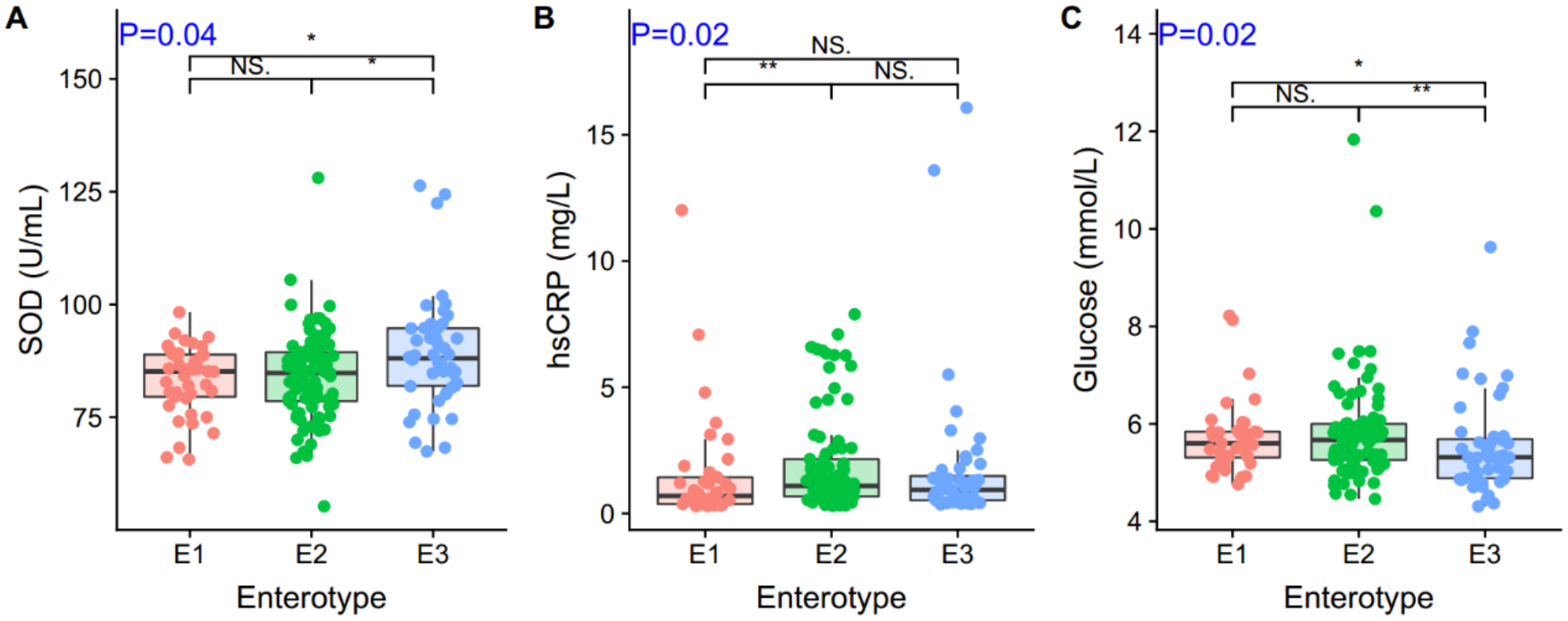
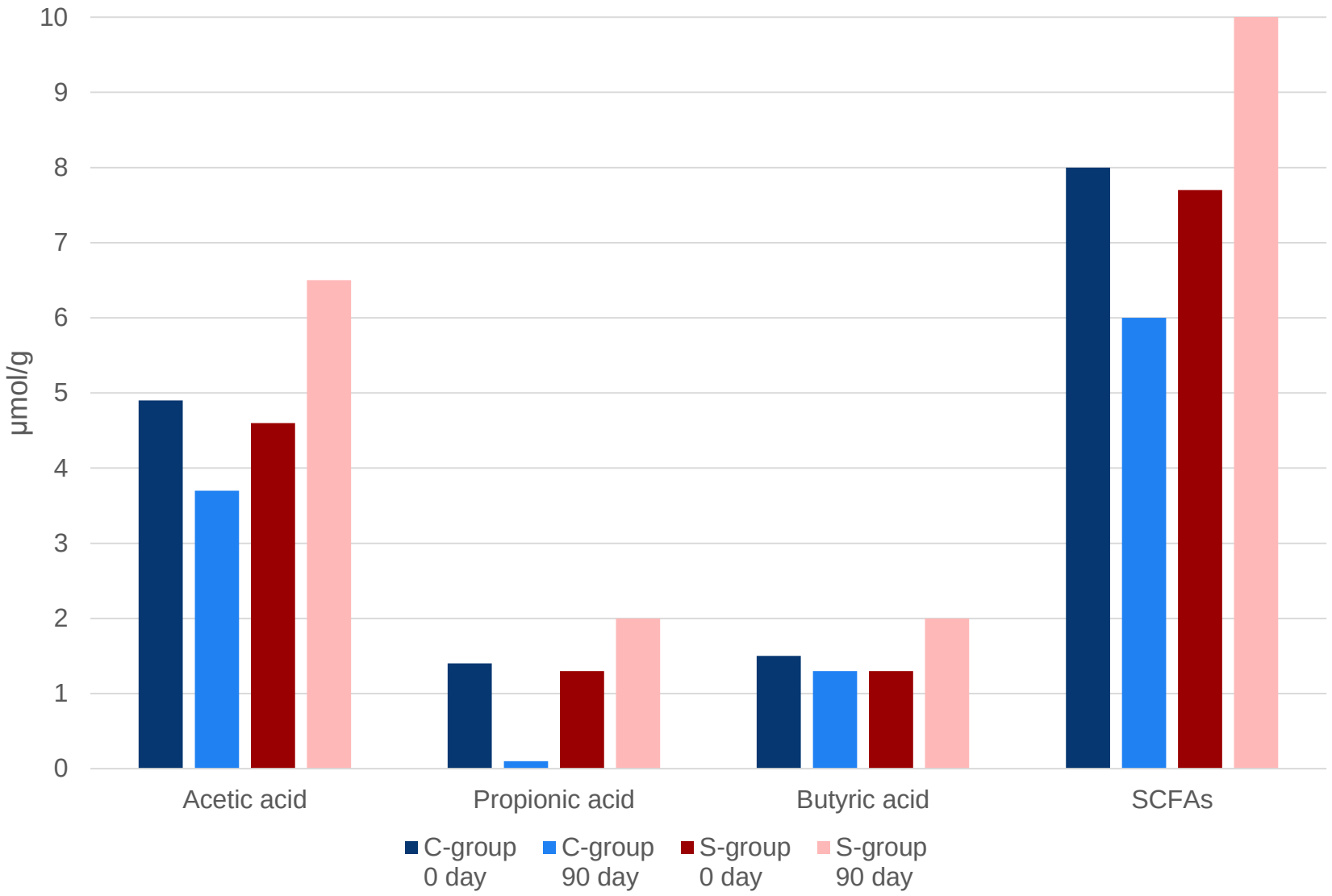
- **E3 (Butyric acid-producing bacteria): higher SOD & lower fasting blood glucose**



Results



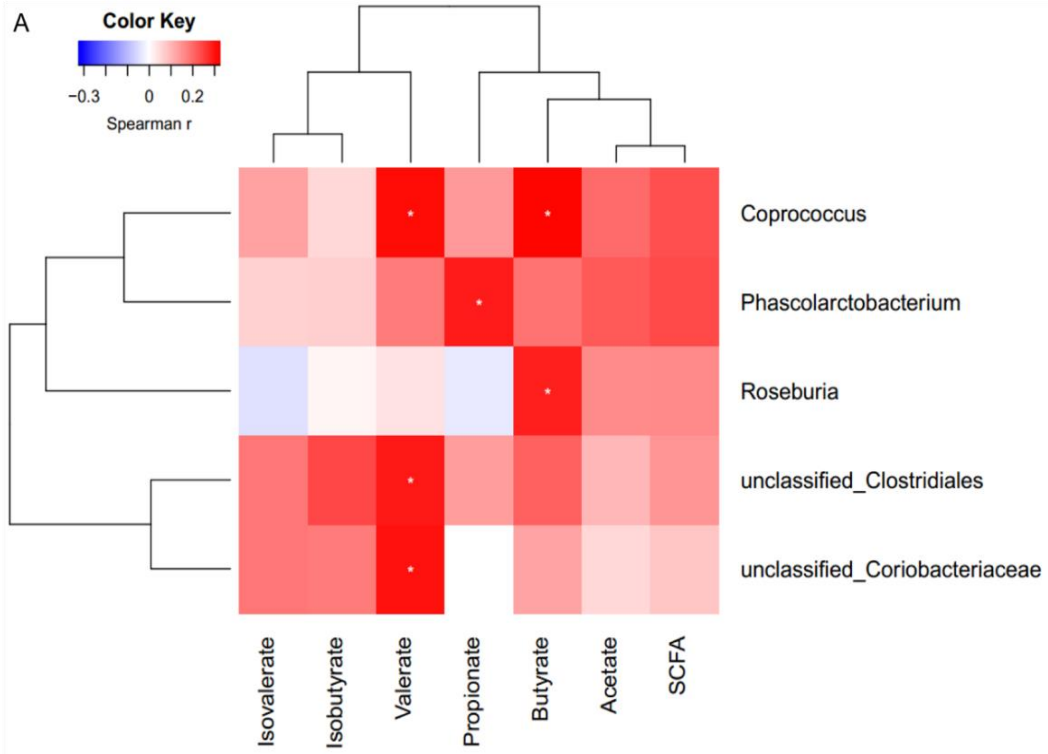
Acetic acid=0.018

Propionic acid =0.030

Butyric acid =0.027

SCFAs=0.018

Results



Phascolarctobacterium

Positively correlated with propionic acid

Coprococcus
Roseburia

Positively correlated with Butyric acid

Coprococcus
*unclassified_*
Clostridiales
*unclassified_*
Coriobacteriaceae

Positively correlated with valeric acid

Conclusions

- Sea-buckthorns whole fruit pulp had no significant effects on body weight, BMI, body fat rate, waist and hip circumference, blood sugar, antioxidant capacity and other indicators in patients with hypercholesterolemia.
- For patients with high baseline TC level, sea-buckthorns whole fruit pulp could reduce serum TC to a certain extent, suggesting that sea buckthorn puree may be expected to have a certain lipid-lowering effects on patients with hypercholesterolemia at high risk.
- Sea-buckthorns whole fruit pulp also reduced the level of hsCRP and systolic blood pressure, suggesting that sea-buckthorns whole fruit pulp might have anti-inflammatory and anti-hypertensive effects on patients with hypercholesterolemia, but more trials are needed to provide more conclusive evidence in the future.
- Sea buckthorn puree could effectively increase the species and abundance of butyric acid-producing bacteria in intestinal tract of patients with hypercholesterolemia. There are abundant of evidences indicate that butyric acid concentration is negatively correlated with inflammation in human body. The SCFAs concentration changes after intervention also confirmed that sea-buckthorns whole fruit pulp could promote gut microbiota metabolism of SCFA, and then play a role in cardiovascular protection.

Thank you!