Effect of Probiotic Supplementation on Cognitive Function and Metabolic Status in Alzheimer's Disease:

A Randomized, Double-Blind and Controlled Trial

Frontiers in Aging Neuroscience

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Dementia

- Chronic progressive neurodegenerative disease
- Increasing health problem in the aging population
- Increasing socioeconomic burden

Alzheimer

- one of the most common forms of senile dementia
- begins with memory loss of recent events (short-term memory impairment) and finally robs the patients of their sense of self
- Early onset of the disease, older age, low education level, and several poor health conditions affect the prevalence rate of the disease and the degree of cognitive impairment

Alzheimer

- Increased biomarkers of oxidative stress, inflammation and chronic neuroinflammation are reported to be associated with AD
- metabolic alterations such as insulin resistance hyperglycemia and dyslipidemia are associated with the pathogenesis and development of AD

Microbiota

- A dynamic ecosystem which is influenced by several factors including genetics, diet, metabolism, age, geography, antibiotic treatment, and stress.
- a clear association between changes in the microbiota and cognitive behaviors as the microbiome-gut-brain axis

Microbiota

- Some complications such as cognitive disorders, oxidative stress, neuroinflammation, insulin resistance, and altered lipid metabolism, which are observable in AD, to be influenced by the gut flora as well as probiotics.
- this clinical trial was designed to assess if reinforcement of the intestinal microbiota via probiotic supplementation helps to improve cognitive and metabolic disorders in the AD patient.


Open
هراز
haraz
ماست سبو
پروبیو تیک
کم چرب
ماست همرده


هراز
پنیر فتا دوشه
کم نمک + کم چرب
پروبیوتیک
PROBIOTIC
پنیر فتا دوشه
کم نمک
کم چرب + پروبیوتیک


کفیر
ونوس


GeriLact
30


پروبیوتیک
جوانه


Dorna
New
Probiotic
Cake
Supports Digestive and Immune Health
کیک پروبیوتیک
ذرنا
2x
بهبود عملکرد
دستگاه گوارش و سیستم ایمنی بدن


ProBiotic
NEW
Nimchasht
پروبیوتیک


نت برگ
Netbarg
عتیق
Probiotic
عتیق
بدون مواد نگهدارنده و مواد شیمیایی

OBJECTIVES: To determine the Effect of Probiotic Supplementation on Cognitive Function and Metabolic Status in Alzheimer's Disease

DESIGN: A Randomized, Double-Blind and Controlled Trial

SETTING: Kashan

PARTICIPANTS: 60 AD (60–95 years old) residing at the Welfare Organizations. for 12 weeks.

MEASUREMENTS:

Assessment of Anthropometric Measures.

The primary outcome measurements were Mini-Mental State Examination (MMSE) that used to assess cognition in the AD subjects.

The secondary outcome measurements were biomarkers of oxidative stress, inflammation and metabolic profiles.

RESULTS:

- After 12 weeks intervention, compared with the control group, the probiotic treated patients showed a significant improvement in the MMSE score (P <0.001).
- changes in plasma malondialdehyde (P <0.001), serum high-sensitivity C-reactive protein (P <0.001), homeostasis model of assessment-estimated insulin resistance P = 0.002), Beta cell function (P = 0.001), serum triglycerides (P = 0.003), and quantitative insulin sensitivity check index (P = 0.006) in the probiotic group were significantly varied compared to the control group.

- **probiotic treatment had no considerable effect on other biomarkers of oxidative stress and inflammation, fasting plasma glucose, and other lipid profiles.**

Methods

- Randomized, double-blind, and controlled clinical trial.
- 60 AD (60–95 years old) residing at the Kashan Welfare Organizations.
- The AD patients were diagnosed following the NIAA 2011 criteria.
- Patients with **metabolic disorders**, **chronic infections** and/or **other clinically** relevant disorders with exception of AD and consuming **antibiotics** and **probiotic supplements within 6 weeks** prior to the study, taking **other forms of probiotics** were excluded.

مداخله

Intervention

- randomly divided into two groups to receive either milk (control group, n = 30: 24 females and 6 males) or milk containing a mixture of probiotics (probiotic group, n = 30: 24 females and 6 males) for 12 weeks.
- The probiotic supplemented group took 200 ml/day probiotic milk containing **Lactobacillus acidophilus, Lactobacillus casei, Bifidobacterium bifidum, and Lactobacillus fermentum (2 × 109 CFU/g for each)** for 12 weeks.

- Assessment of Anthropometric Measures (Weight and height , BMI was calculated)
- The primary outcome measurements were Mini-Mental State Examination (MMSE) that was used to assess cognition in the AD.

- The secondary outcome measurements were biomarkers of oxidative stress, inflammation and metabolic profiles.

- Total glutathione (GSH), Malondialdehyde (MDA),Serum (hs-CRP) ,Plasma nitric oxide (NO) , FPG, serum TG, total chol, LDL, and HDL.
- The homeostatic model of assessment for insulin resistance (HOMA-IR), homeostatic model assessment for B-cell function (HOMA-B) and the quantitative insulin sensitivity

Results

- **No side effects** were reported following administration with probiotic in AD patients throughout the study.
- Mean age, height, weight, and BMI at baseline and end of trial **were not statistically different between the two groups** .
- Based on the 3-day dietary records obtained at study baseline, end of trial and throughout the trial, we found **no significant difference in mean dietary macronutrient and micronutrient intakes** between the two groups .
- improvement in MMSE score in the probiotic group (+27.90% ± 8.07) compared to their control counterparts (−5.03% ± 3.00). The difference between the two groups of testing was statistically significant (P <0.001).

TABLE 2 | Mean values of the behavioral test and the biomarkers measurements in the probiotic and control groups.

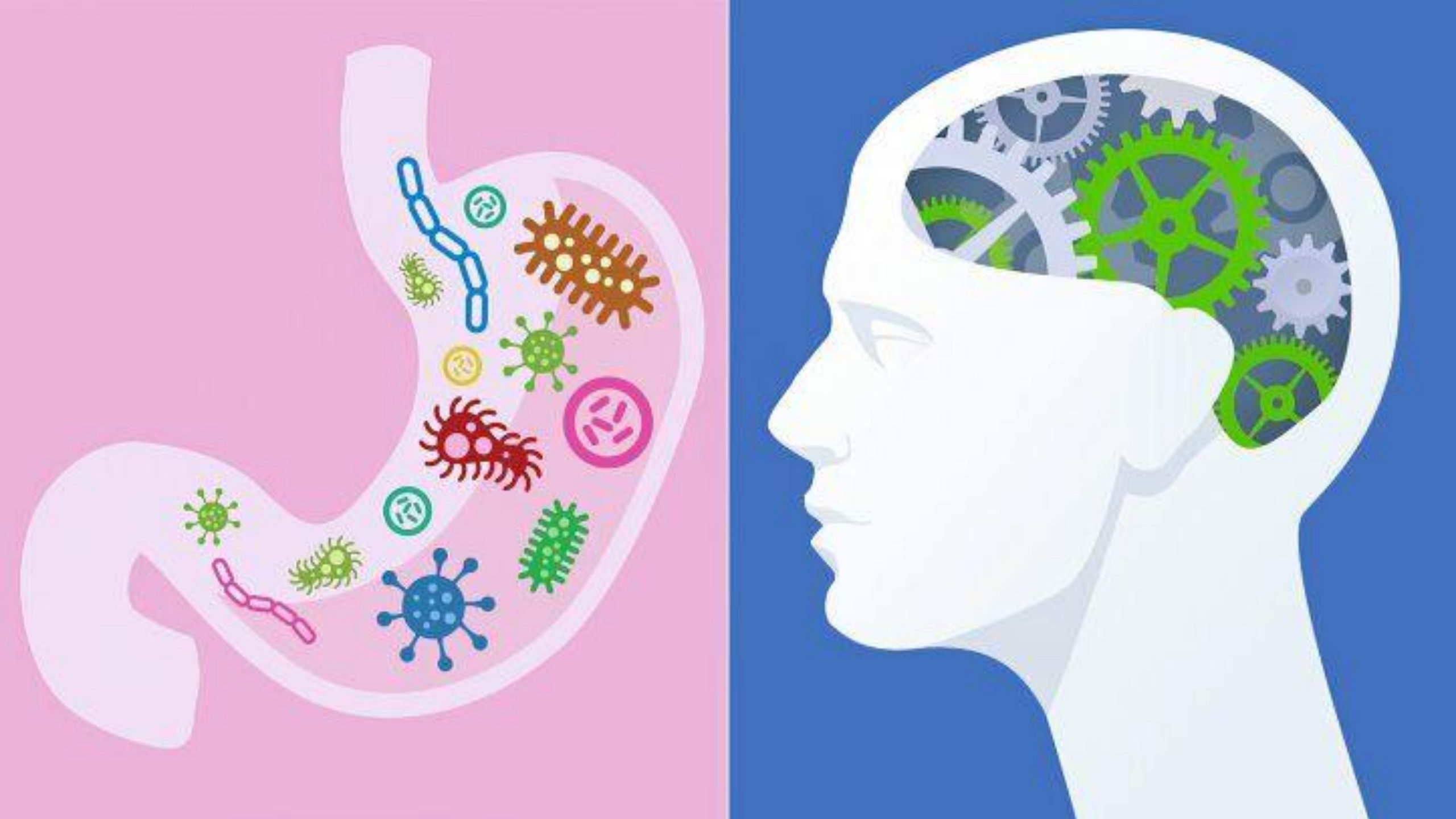
	Control group		Probiotic group		Difference between the two groups
	Baseline	End-of-trial	Baseline	End-of-trial	*P*-value[a]
MMSE (score out of 30)	8.47 ± 1.10	8.00 ± 1.08	8.67 ± 1.44	10.57 ± 1.64	<0.001
TAC (mmol/L)	895.66 ± 25.96	915.35 ± 26.60	876.13 ± 26.48	922.42 ± 28.53	0.25
GSH (μmol/L)	390.78 ± 17.46	386.76 ± 20.33	377.26 ± 14.82	401.25 ± 16.68	0.19
MDA (μmol/L)	4.26 ± 0.30	4.32 ± 0.31	4.31 ± 0.26	3.21 ± 0.23	<0.001
hs-CRP (μg/ml)	4.54 ± 1.30	6.59 ± 1.14	6.61 ± 1.24	5.44 ± 0.85	<0.001
NO (imol/L)	44.76 ± 0.53	45.56 ± 0.82	43.68 ± 0.64	44.37 ± 1.14	0.93
FPG (mg/dl)	83.40 ± 2.36	86.77 ± 4.07	92.00 ± 7.92	94.13 ± 7.72	0.98
HOMA-IR	1.43 ± 0.24	2.08 ± 0.27	1.30 ± 0.13	1.60 ± 0.19	0.002
HOMA-B	25.04 ± 3.21	37.86 ± 4.64	27.36 ± 3.50	22.06 ± 2.43	0.001
QUICKI	0.38 ± 0.01	0.36 ± 0.01	0.38 ± 0.01	0.37 ± 0.01	0.006
Triglycerides (mg/dl)	84.32 ± 4.65	81.74 ± 4.76	119.60 ± 10.25	94.33 ± 10.04	0.003
VLDL (mg/dL)	16.86 ± 0.93	16.35 ± 0.95	23.92 ± 2.05	18.87 ± 2.01	0.003
LDL (mg/dl)	90.44 ± 4.58	94.34 ± 4.39	85.16 ± 4.14	90.64 ± 5.29	0.76
HDL (mg/dl)	51.27 ± 1.75	44.49 ± 1.97	45.81 ± 1.45	38.82 ± 1.35	0.93
Total cholesterol (mg/dl)	158.57 ± 5.75	155.17 ± 5.59	154.88 ± 4.91	148.32 ± 5.43	0.63
Total/ HDL-cholesterol	3.15 ± 0.12	3.62 ± 0.16	3.43 ± 0.12	3.95 ± 0.2	0.81

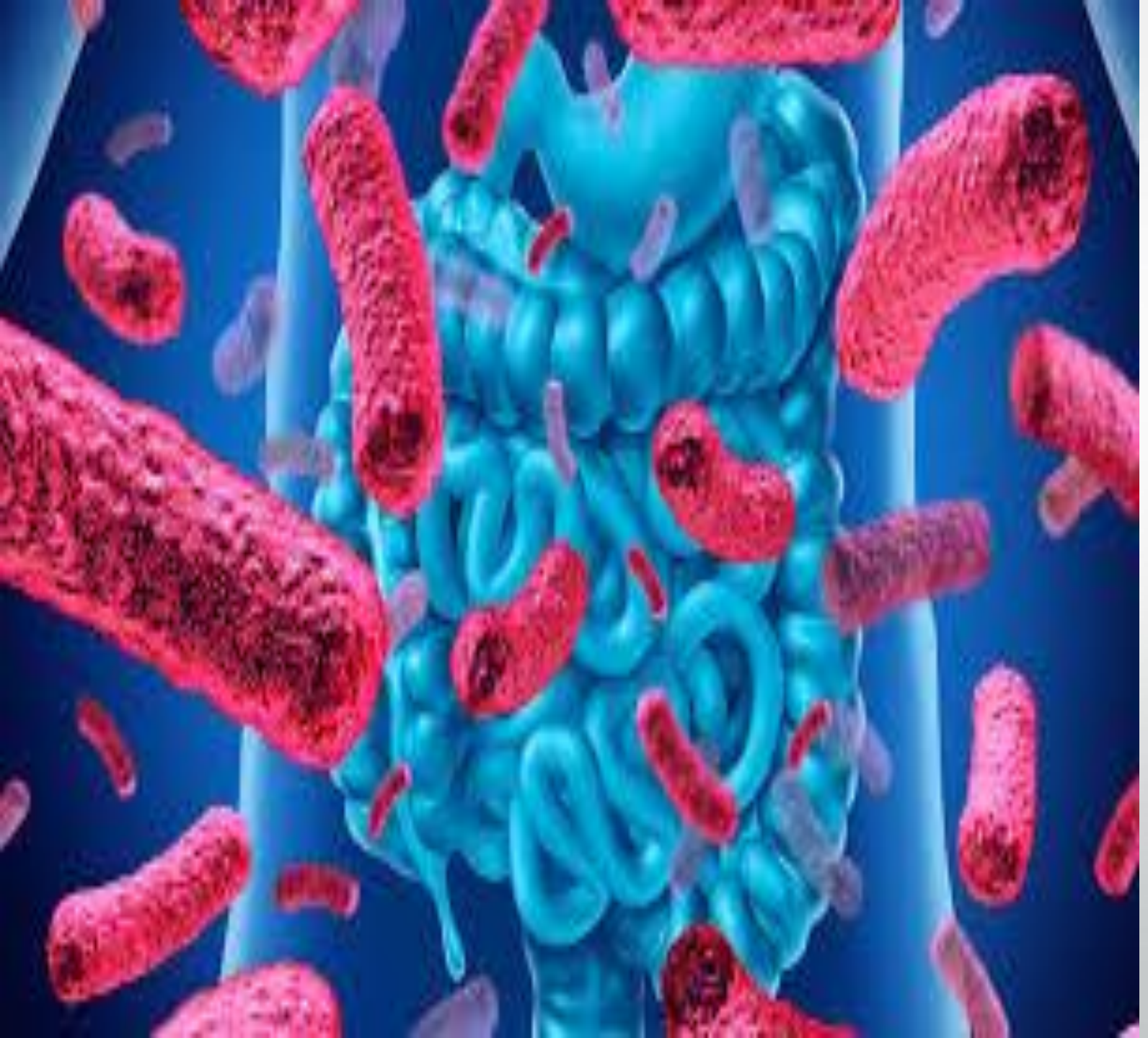
Data are mean ± SEM.[a] represents P-values obtained from the time × group interaction analysis. FPG, fasting plasma glucose; GSH, total glutathione; HOMA-IR, homeostasis model of assessment-estimated insulin resistance; HOMA-B, homeostasis model of assessment-estimated B cell function; hs-CRP, high-sensitivity C-reactive protein; MMSE, mini-mental state examination; MDA, malondialdehyde; NO, nitric oxide; QUICKI, quantitative insulin sensitivity check index; TAC, total antioxidant capacity.

- decreased the level of the factors **affecting metabolism of carbohydrates.**
- The changes in **hs-CRP** were (P <0.001).
- **HOMH-IR index** decreased in the probiotic group (P = 0.002).
- reduced the **HOMA-B index** leading to a significant variation between the two groups (P = 0.001).

- ineffective on the FBP
- The probiotic supplementation differently influenced the lipid profiles. The **TG level** was substantially decreased (P = 0.003)
- Although the concentration of **VLDL was reduced** in the probiotic (P = 0.003)
- other lipid profiles (LDL, HDL and cholesterol) were insensitive to the probiotic treatment.

- decrease (P <0.001) in the **MDA** of the probiotic group
- no difference in the level of the TAC and NO





Thank you