



Approximately 72% of Americans are overweight or obese, partially due to the consumption of a Western diet (WD). The highly-processed WD is composed of simple carbohydrates, sugars, and saturated fats. The WD has been identified as a risk factor for Alzheimer's disease (AD) due to the elevated levels of pro-inflammatory cytokines following long-term diet consumption. In contrast to the WD, the Mediterranean diet (MD) is a plant-based, mostly unsaturated fat diet. Research has shown that it is crucial to consume a balanced omega-6 to omega-3 ratio of 1:1 or 2:1, like that in the MD, as elevated ratios found in the WD lead to increased inflammation. Previous studies generally utilize an extremely high-fat Western rodent diet that does not resemble that of the typical American. Thus, our lab designed two novel macronutrient-matched diets that mimic typical American or Mediterranean diets. In the current study, we examined the effects of the typical American diet (TAD) versus the MD in relation to pro-inflammatory cytokine production in serum and gene expression in the dorsal hippocampus of C57BL/6J mice. Following six months of TAD or MD consumption, the mice were treated with one intraperitoneal injection of lipopolysaccharide (LPS) or saline 4 hours prior to euthanasia. In comparison to the MD, mice consuming the TAD had increased expression and levels of pro-inflammatory cytokines in the dorsal hippocampus and serum, respectively.

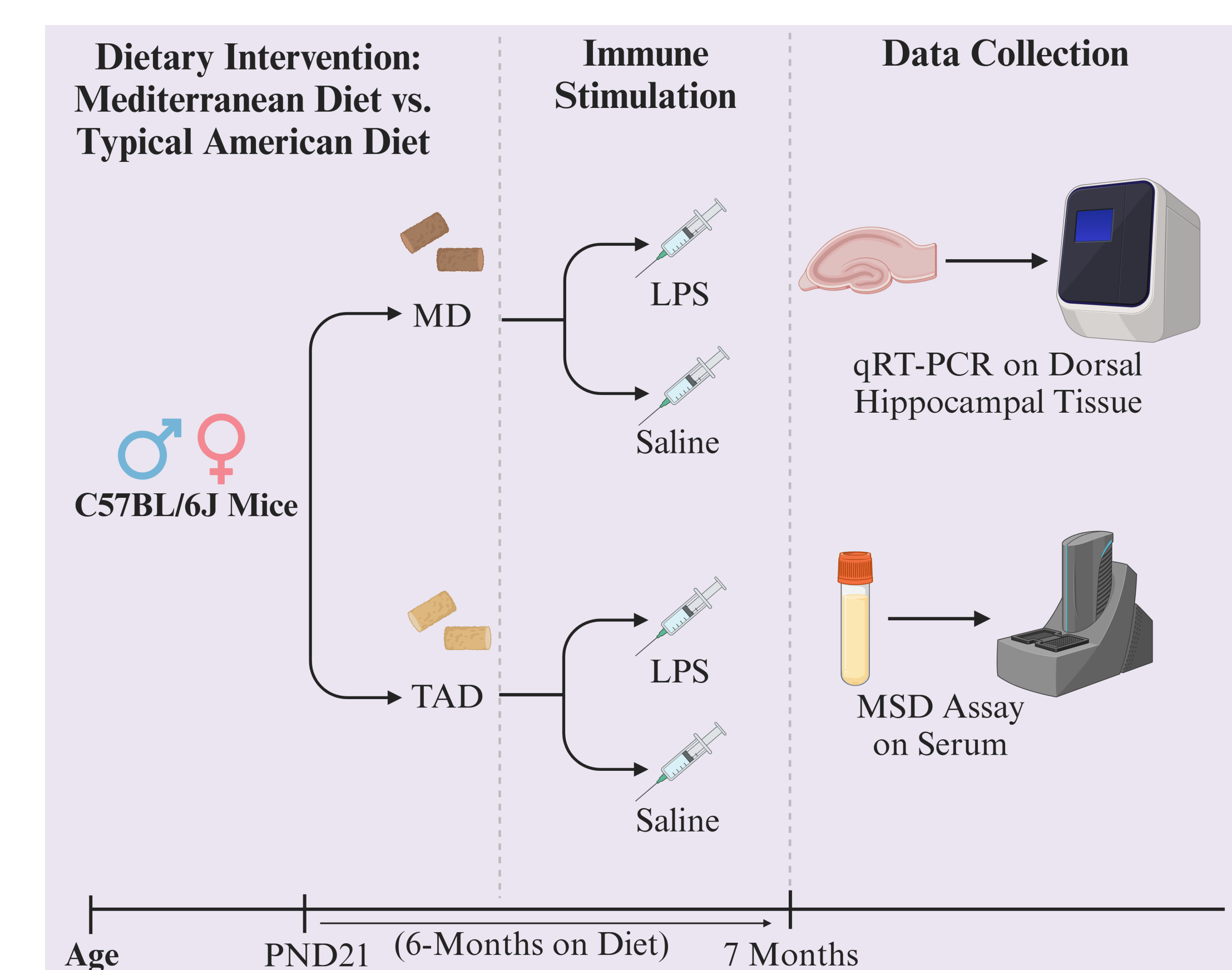


Introduction

- A Western diet (WD) is high in saturated fats and simple carbohydrates, is an inflammatory diet, and has been linked to diseases including Alzheimer's disease (AD)
- A Mediterranean diet (MD) is high in unsaturated fats and complex carbohydrates, which are protective against inflammation and neurodegeneration
- Previous studies lack in comprehensive composition by administering a high-fat WD or one component of the MD
- We created a custom MD and typical American diet (TAD) that mimics the typical food sources of the area, with the only differences in the two diets being the food sources

Methods

	% kcal	MD	TAD
Carb	50	Brown rice & wheat starch	Corn starch
Fat	35	Olive oil, fish oil, & flaxseed oil	Safflower oil, beef fat, butter
Protein	15	Egg whites, soy, & fish protein	Casein (milk fat)



Results

TNF- α levels are elevated in the serum of mice on the TAD

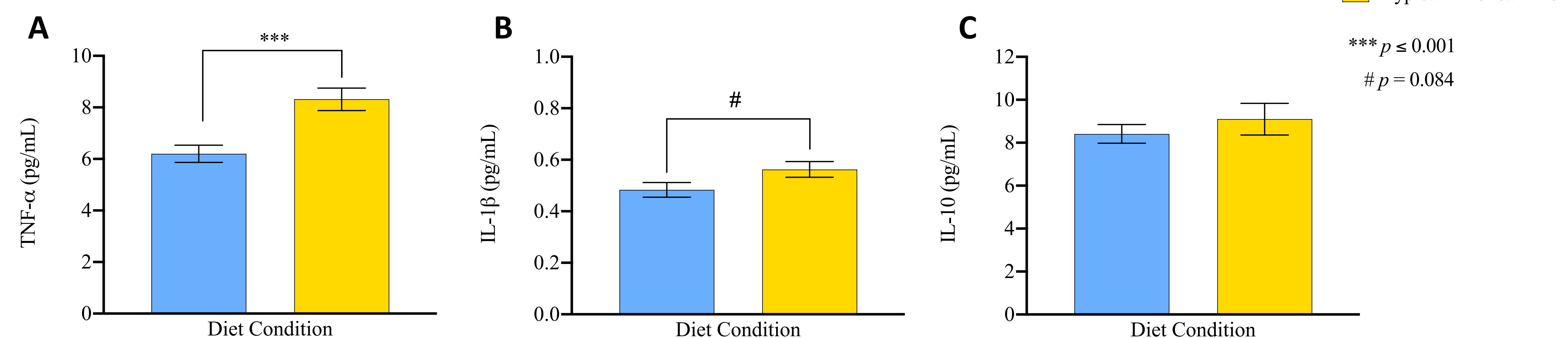


Figure 1. Peripheral Cytokine Production (pg/mL) in Serum of Male Mice. An independent samples 2-tailed t-test of four cytokines was used to compare inflammatory levels. (A) Mice on the TAD produced significantly more TNF-alpha in the serum compared to mice on the MD, $p \leq 0.001$. (B-C) There was no significant difference between dietary conditions, $ps \geq 0.05$. Bars represent mean \pm SEM. $n's = 11-16$.

TNF- α and IL-1 β expression levels are elevated in the dorsal hippocampus of mice on the TAD

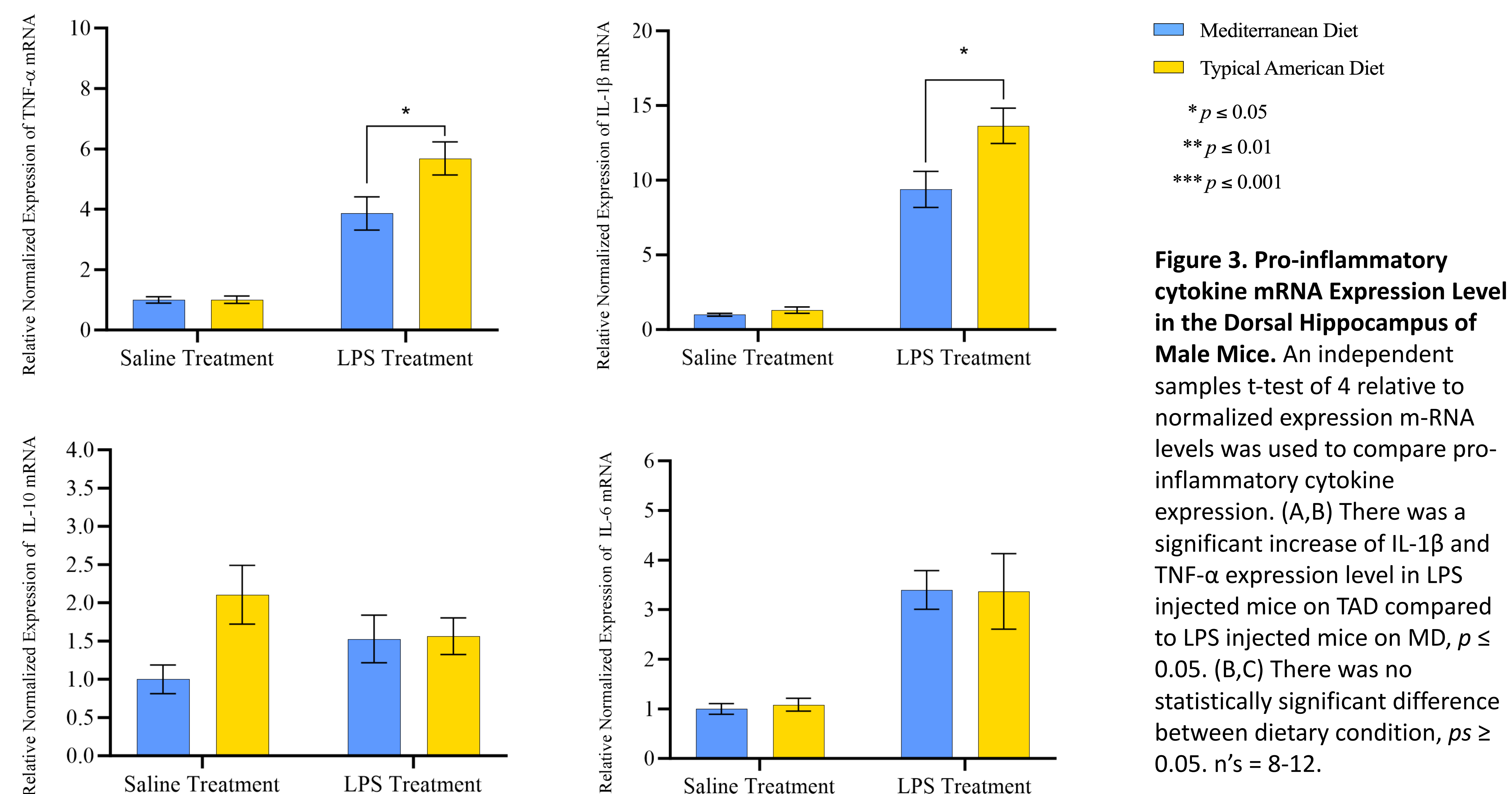


Figure 3. Pro-inflammatory cytokine mRNA Expression Level in the Dorsal Hippocampus of Male Mice. An independent samples t-test of 4 relative to normalized expression m-RNA levels was used to compare pro-inflammatory cytokine expression. (A,B) There was a significant increase of IL-1 β and TNF- α expression level in LPS injected mice on TAD compared to LPS injected mice on MD, $p \leq 0.05$. (B,C) There was no statistically significant difference between dietary condition, $ps \geq 0.05$. $n's = 8-12$.

Conclusions

- The TAD increases serum inflammatory markers and the expression of pro-inflammatory markers in the dorsal hippocampus compared to the MD
- The difference between food sources, rather than available energy, can result in changes in inflammatory status which is a pathology associated with several chronic diseases

Future Directions

- Explore if peripheral inflammatory cytokines induced central inflammation via *de novo* synthesis or by crossing the blood brain barrier (BBB)
- If other markers of chronic diseases, such as oxidative stress and lipid accumulation, are observed in tissues related to inflammation including the liver and adipose tissue

References

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