Background

- Cardiovascular disease (CVD) is the leading cause of death in the United States.
- Aging is the primary risk factor for CVD.
- Overweight/obesity and menopause can exacerbate CVD risk.
- Atherosclerosis is the main pathophysiological process underlying the development of CVD. (Figure 1)
- Vascular endothelial dysfunction is a major initiating step in atherosclerosis.
- The vascular endothelium lines the inner wall of arteries and functions to produce vasoactive molecules that regulate the function and health of arteries, including vasodilation.
- Vascular endothelial dysfunction occurs when the endothelium is no longer able to maintain this normal functional state.
- Functional foods rich in bioactive compounds have been shown to improve endothelial function and may represent a therapeutic strategy for preventing or slowing the development of atherosclerosis.
- Red beetroot juice (RBJ) contains a variety of bioactive compounds beneficial to cardiovascular health including phenolic acids, flavonoids and betalains, as well as nitrates. (Figure 2)

Objective

- To evaluate the effects of RBJ vs. its isolated bioactive components on endothelial function in healthy, overweight/obese men and postmenopausal women aged 40-65 years.

Study Design & Methods

- Baseline Visit
- 4-Week Treatment Period
- 4-Week Follow-up Visit
- 4-Week Washout Period

Laboratory Assays

- DNA will be extracted from buccal swabs. (Figure 5)
- Oral nitrate-reducing bacterial genes will be quantified by qPCR.
- Oral microbial communities will be characterized using 16s sequencing.
- Saliva nitrate and nitrite levels will be quantified using a commercially available colorimetric assay.

Study Design & Methods

Baseline/Follow-Up Tests

- Anthropometrics, blood pressure, and arterial stiffness are assessed at baseline.
- EndoPat is used to quantify endothelial function. (Figure 4)
- Buccal swabs and saliva are collected to quantify nitrate and nitrite profile and oral microbiome.

Expected Results

- Preliminary results indicate a promising effect of RBJ on endothelial function.
- DNA analysis revealed a trend towards increased nitrate-reducing bacterial activity.
- Oral microbiome analysis showed a decrease in atherosclerotic-related bacteria.

Implications

- We hypothesize consumption of RBJ for 4 weeks will lead to the greatest improvement in endothelial function.
- We also expect that these improvements will be associated with alterations in the oral microbiome.
- These results would suggest that the bioactive compounds found in RBJ work synergistically to improve endothelial function.
- RBJ consumption could be a potential therapeutic strategy for preventing or slowing the development of atherosclerosis and reducing CVD risk. Future research could explore potential underlying mechanisms, including the role of the gut microbiota.

References

5. American Heart Association, 2015, Circulation

Clinical trial conducted at the University of Colorado Anschutz Medical Campus, Aurora, Colorado. The study was supported by the Colorado Agriculture Experiment Station, National Institute of Food and Agronomy.