

# Effects of exercise and beetroot supplementation on asymmetric dimethylarginine (ADMA) and biomarkers of endothelial function in overweight and obese older subjects



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## 1 Background

Nitric Oxide (NO) is released by the endothelium and is involved in the relaxation of blood vessels<sup>(1)</sup>. Dietary intervention enhancing NO synthesis such as inorganic nitrate or arginine can be helpful for the prevention of hypertension and cardiovascular diseases. Beetroot is particularly rich in inorganic nitrate and its beneficial effects on cardiovascular function have been recently reported.

## 2 Aims

- To research whether biomarkers of endothelial dysfunction (e.g. ADMA) (2) were differently affected by beetroot juice supplementation and resistance physical exercise
- To investigate the effects of beetroot juice supplementation on blood pressure in older overweight and obese subjects
- To investigate the relationship between changes in ADMA levels and biomarkers of Nitric Oxide production (e.g. Nitrate)

The samples were obtained from two studies :

- one lasting 7 days, compared the effects of resistance physical exercise and beetroot (Nitrate) supplementation on NO synthesis, and
- the other, lasting 28 days, monitored the potency and duration of the effect of beetroot supplementation on NO synthesis.

## 3 Methods

Urine and plasma (blood) samples were tested for nitrate and ADMA using Nitrate/Nitrite Colorimetric Assay Kits and an ADMA Enzyme Linked Immuno-Sorbent Assay (ELISA) Kit respectively.

The absorbance values were obtained using spectrophotometry and subsequently analysed to derive the concentrations of each molecule.

## References

- (1) Furchgott RF, Zawadzki JV. The obligatory role of endothelial cells in the relaxation of arterial smooth muscle by acetylcholine. *Nature*. 1980; 288:373–376.
- (2) Siervo M, Corander M, Stranges S, Bluck L. Post-challenge hyperglycaemia, nitric oxide production and endothelial dysfunction: the putative role of asymmetric dimethylarginine (ADMA). *Nutr Metab Cardiovasc Dis*. 2011; 21(1): 1-10.

## 4 Results

Figure 1: Graph of average Nitrate concentrations of each study group at different time-points (7 days)

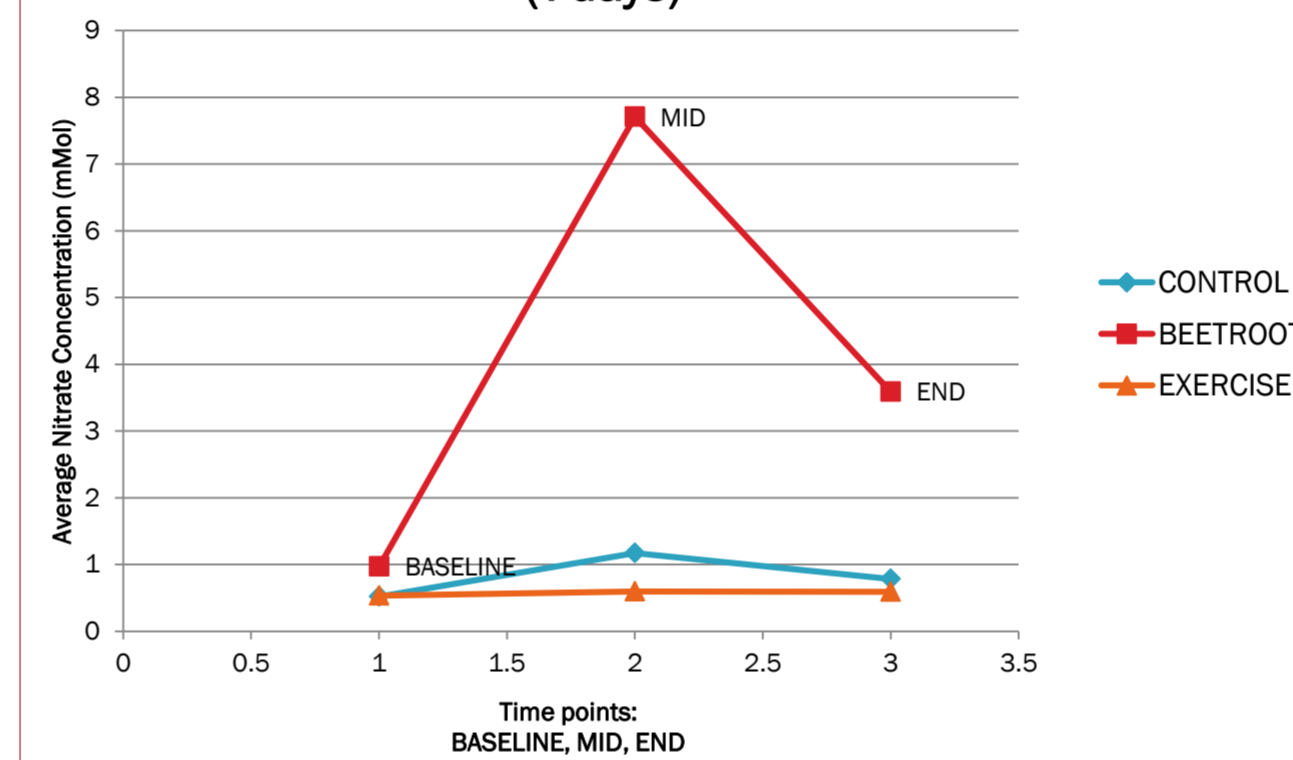


Figure 1 shows a great rise in nitrate concentration in subjects given beetroot juice (Nitrate supplement). Also, no significant change in the levels of biomarkers of NO production was recorded in the exercise and control groups as was expected.

Figure 2 shows a greater decrease in ADMA in the resistance physical exercise cohort than in the cohort given beetroot juice; the control group expectedly showed an overall increase in ADMA concentrations.

Figure 3 shows that nitrate concentrations return to baseline levels after one week from the point of interruption of the beetroot juice intervention (Day 21 – Day 28).

Figure 2: Graph of average ADMA concentrations of each group at Baseline and End (7 days)

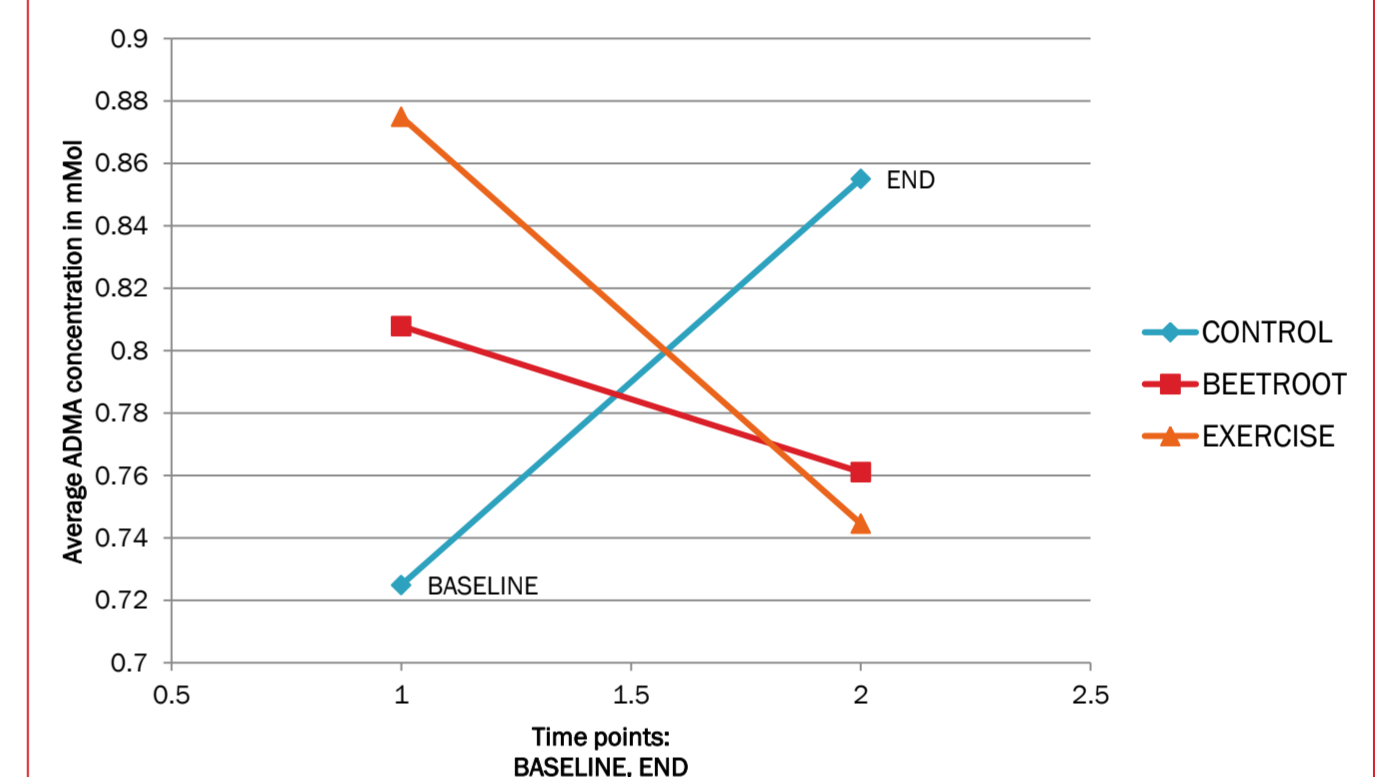
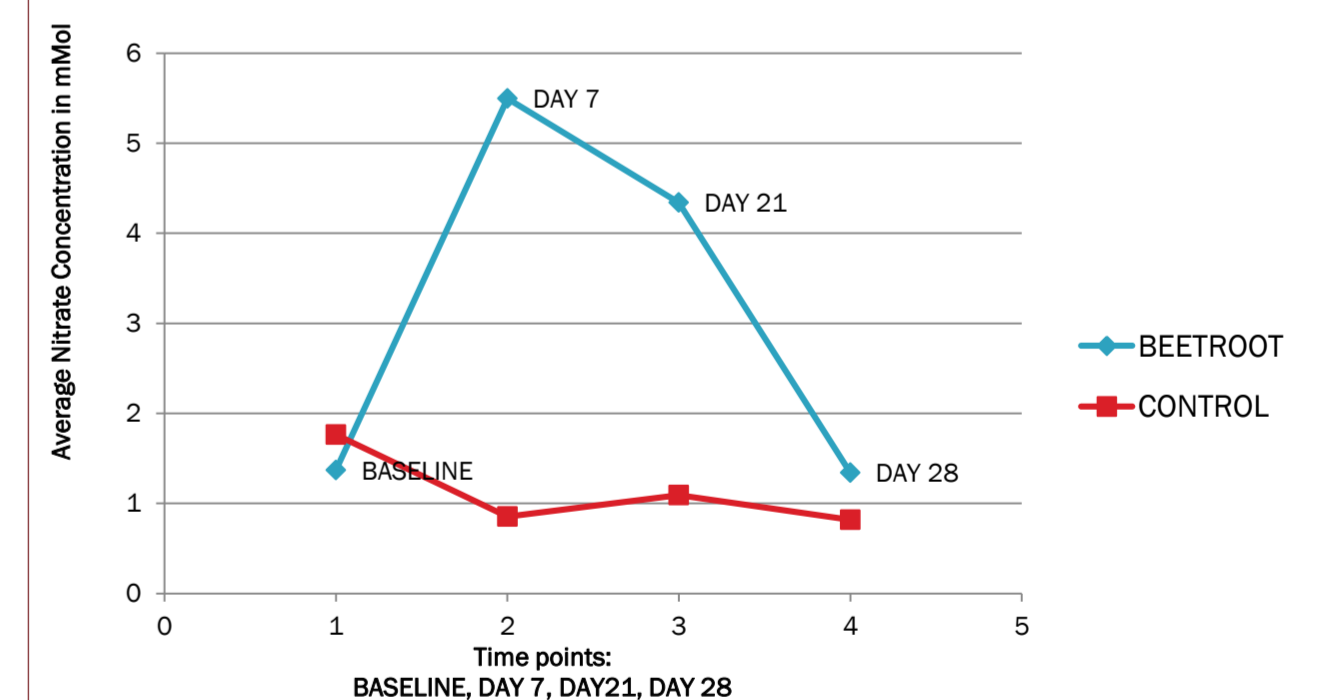


Figure 3: Graph of average Nitrate concentrations of Beetroot and Control groups (28 days)



## 5 Discussion and Conclusion

- Beetroot juice supplementation is an effective dietary intervention to increase nitrate concentrations and consequently increase NO production. However, it must be noted that these effects wear off within a week of cessation of intervention
- Resistance physical exercise has beneficial effects on ADMA levels which may indicate positive effects on endothelial function
- Further research is needed to develop the exact dietary supplementation strategies for the management/treatment of diseases linked to endothelial dysfunction

**Acknowledgements:** A great many thanks to Dr M. Siervo for the opportunity to work under his tutelage.