Beetroot may lower blood pressure and bread could serve as a ‘useful vehicle’ for delivery

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The consumption of beetroot juice or bread products enriched with beetroot may lower blood pressure over a 24h period after ingestion in healthy male individuals. These are the results of two studies performed by researchers from the Hugh Sinclair Unit of Human Nutrition, and the Institute for Cardiovascular and Metabolic Research (ICMR), both part of the University of Reading, UK.

High blood pressure (or hypertension) is one of the risk factors for the development of cardiovascular diseases (CVD) and its reduction is linked to a lower incidence of CVD events. Blood pressure, caused by heart contraction, is expressed in millimetres of mercury (mmHg) and knows two values; the maximum (systolic) and the minimum (diastolic). The European Society for Cardiology defines a systolic pressure range of 120-129 mmHg and a diastolic pressure range of 80-84 mmHg as normal. It has been suggested that ‘treatment’ should be of a more preventive nature and thus focus on people whose blood pressure is (still) within the range that is considered healthy (normotensive).

The consumption of fruits and vegetables is known to be protective against high blood pressure and CVD, but so far studies have not been able to link this to specific nutrients like antioxidant vitamins or flavonoids. In particular green leafy vegetables and beetroot may protect against CVD and it has been suggested that the high nitrate content might be responsible for these beneficial effects. In the human body nitrate is converted to nitric oxide (NO), which is involved in the relaxation of the blood vessels (vasodilatation). Moreover, beetroot contains other compounds, namely betalains, which may also contribute to the protection against hypertension and CVD by means of their antioxidant properties.

The current article describes two separate studies with the respective objectives to 1) determine the dose-dependent effect of nitrate-rich beetroot juice on blood pressure over a 24h period in order to establish the lowest dose of nitrate having a functional effect on blood pressure, and 2) to study whether beetroot-enriched bread had beneficial effects on blood pressure similar to beetroot juice. A secondary objective was to assess the impact of betalains on blood pressure reduction. In both studies, the healthy, normotensive participants were equipped with a monitor enabling to frequently measure blood pressure, while urine samples were collected at baseline, after 2, 4 and 24 hours. In the first 4 hours the participants stayed under resting conditions in the research unit.

The 18 participants in the first study received 4 different 500 g drinks with 0, 20, 50 and 100% beetroot juice. In the second study the intervention for 14 other subjects consisted of 200 g bread without beetroot or 200 g bread enriched with either 100 g white or red beetroot.

Study 1 showed that compared with water, beetroot juice consumption significantly lowered both diastolic and systolic blood pressure over 24h, even at the lowest concentration. For systolic (and nearly for diastolic) blood pressure it did so in a dose-dependent manner. In study 2, both diastolic and systolic blood
pressure were lower following consumption of bread enriched with either 100 g white or red beetroot. However, statistical significance was reached only for red beetroot enriched bread. The peak reduction in blood pressure in both studies occurred 2 to 3 hours after the intervention.

The authors note that even though white beetroot does not contain beta-cyanin (one of the two subclasses of betalains, giving red beetroot its colour), it lowered blood pressure to a similar extent, and therefore suggest that dietary nitrate was partly responsible for the observed effects. Other compounds in beetroot with potential beneficial properties are vitamins C and K, folate, dietary fibre and polyphenols.

A limitation of the study, as reported, is the lack of blood samples that could verify whether the increased intake of nitrate also results in increased blood nitrate levels. However, urine levels of mono-nitrogen oxides (NOx), an indicator for NO production, increased in accordance with the reductions in blood pressure. This indicates a possible association between the blood pressure lowering effects of beetroot and nitrate.

The authors conclude that beetroot lowers blood pressure in a nearly dose-dependent manner and that bread, as a widely consumed food, may serve as a ‘useful vehicle’ for the delivery of dietary nitrate and to increase the intake of vegetables. A larger study is being performed to verify the current findings and to extend them by looking into additional parameters of blood vessel function.

For further information, see