

**For issue on or after: 17 November 2011**

**AS GCE APPLIED SCIENCE**

**G623/INSERT** Cells and Molecules

**PLAN FOR AN INVESTIGATION**

**INSERT**



**INFORMATION FOR CANDIDATES**

- The abstracts on page 2 of this insert are to give you some background that you might find helpful in planning for the task that follows. Not all the information included will be directly relevant and you are expected to select the information that is relevant to the task.
- This document consists of **2** pages. Any blank pages are indicated.

## Beetroot juice enhances performance

Research by the University of Exeter, published in the journal *Medicine and Science in Sports and Exercise*, has shown that drinking beetroot juice enables competitive-level cyclists to cut down the time it takes to ride a given distance. This was the first study that showed that beetroot juice could be effective in a simulated competition environment.

For the study, nine club-level competitive male cyclists were asked to compete in time trials. All the riders were asked to do each time trial twice. Each time they drank half a litre of beetroot juice beforehand. On one occasion they had normal beetroot juice, on the other occasion – unbeknown to the triallists – the beetroot juice had a key ingredient, nitrate, removed.

Results showed that when the cyclists drank ordinary beetroot juice they had a higher power output (measured in watts) for the same level of effort – suggesting their muscles and cardiovascular system were being more efficient.

Professor Andrew Jones, from the University of Exeter, lead author on the research, said: “This is the first time we’ve studied the effects of beetroot juice, and the high nitrate levels found in it, on simulated competition.

“The findings showed an improvement in performance that, at competition level, could make a real difference – particularly in an event like the Tour de France where winning margins can be tight.”

Beetroot juice is a natural source of nitrate, which is thought to be the active ingredient in affecting an athlete’s performance.

## Beetroot juice reduces blood pressure

Dr Andrew Webb from the William Harvey Research Institute at Barts and the London School of Medicine, and colleagues from other institutions around the UK, conducted this research.

This was a randomised trial of 14 healthy subjects using a crossover design in which participants were given both 500ml of beetroot juice or 500ml of water in a random order, seven days apart. There were three parts to the study, which aimed to test the researchers’ theory that beetroot juice, which has a high soluble nitrate content, might be converted to nitric oxide by bacteria in saliva and that this chemical could dilate blood vessels and cause a drop in blood pressure.

## Beetroot pigments

Beetroot contains red pigments called betalains, located within the cell vacuole. Normally the pigments cannot pass through membranes. However, changes in temperature affect membrane stability which can result in leakage of the betalain pigments.



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