

Vitamin B for brain food

Supplementing the healthy brain

New research from Swinburne University of Technology suggests vitamin supplements may have a positive effect on how healthy adults think and feel.

With support from pharmaceutical company, Bayer, the Swinburne Centre for Human Psychopharmacology has examined the effect of multivitamins and minerals in the brain across different age groups and under varying conditions.

Vitamins are organic compounds required for the body to function healthily, but which the body cannot make. Some, including the B vitamins — thiamine, riboflavin, niacin, and B12 — play a pivotal role in a range of cellular mechanisms, including mitochondrial energy production and neurotransmitter synthesis.

The Swinburne group's most recent work looked at the long-term effects of the multivitamin Berocca, which is made by Bayer, and was based

on a randomised, double-blind, placebo-controlled study, involving 71 adults between 18 and 40 years old. Each participant took a Berocca or a placebo with breakfast every morning for four weeks and underwent tests using two techniques for visualising brain activity, functional Magnetic Resonance Imaging (fMRI) and Steady State Visually Evoked Potential (SSVEP), known to cause mental fatigue over relatively short periods.

Participants' brain activity was measured while they performed cognitive tasks, including those using working memory — remembering spatial locations, and marking when odd and even numbers are consecutive in a string of random digits.

The work demonstrated that supplementary vitamins had a discernable effect in healthy adults. "They're getting into the brain and they're hav-



ing an effect, which I think is a very important first step," said Research Leader and Director of the Centre for Human Psychopharmacology, Professor Andrew Scholey.

There were increased levels of the B vitamins in the blood of those who had been taking the multivitamin and a reduction in the mildly toxic molecule homocysteine. Those taking Berocca also reported improvements in mood over the four-week period.

There was also a significant correlation between fMRI-measured brain activation and cognitive perfor-

mance in participants fatigued from SSVEP.

Earlier pilot studies at Swinburne had suggested that improvements in attention can be achieved after a single dose of multivitamins and that the effect may be evident as soon as 30 minutes after taking the tablet.

Scholey and his colleagues are now seeing if these effects can be replicated in a larger-scale study to validate the findings. They are also investigating the mechanism by which the benefit of vitamins may be occurring in the brain, which could lead to new treatments for mood and cognition. ■

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Accounting for unchartered waters

An accounting-based method for reporting the amount of available water in a river system has been developed by a Swinburne researcher

The use of water from the huge Murray-Darling River Basin in eastern Australia remains a contentious issue after more than a decade of legal wrangling, policies and plans. But, there is a stronger consensus about how much water the basin actually contains, thanks to an emerging discipline called water accounting, developed by a team including a Swinburne researcher.

Professor Keryn Chalmers, Dean of Swinburne Business School, was part of a team of financial accountants who developed a conceptual framework for general-purpose water accounting.

Every drop, including rainfall, evapotranspiration, surface and ground water is counted. The information will guide the Council of Australian Governments when it meets in 2017 to decide how much water is required to maintain river flows.

"The goal was to create a useful reporting system to inform decision-makers about water resources,



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Smart grid to address balance of power

Australia's electricity grid needs maintenance. But rather than patching it up and carrying on, Professor Qing-Long Han says we should prepare for the future.

A Swinburne University of Technology researcher is part of a team that has come up with a plan to upgrade Australia's electricity network and save taxpayers billions of dollars.

The ageing electricity grid is one of the largest pieces of infrastructure in the country. But, it was built in an era when electricity flowed one way — from power stations to the consumer.

The system is no longer linear, as homes and business-owners increasingly install solar panels and supplement their network supply. Some feed excess electricity back into the grid, creating a two-way flow of electrons.

Distinguished Professor Qing-Long Han, Swinburne's Pro Vice-Chancellor (Research Quality) said the grid sometimes struggles with this intermittent, two-way supply and demand. He said some power companies have restricted new solar connections because they don't feel confident

in their capacity to maintain a steady electricity supply with these fluctuating sources.

Professor Han and his colleagues from Griffith University, Central Queensland University and RWTH Aachen University of Technology in Germany have devised a system that would utilize the existing infrastructure, but bolt on 21st-century technology to maximize the value Australians get from the grid.

The system employs the mathematical concept of advanced networked control to manage switching between the various sources of supply — whether that be a large wind farm, a coal-fired power station, an industrial battery, or a lone solar panel on a suburban street.

With advanced networked control, local sources of power and batteries can communicate with each other and work collaboratively to co-ordinate their supply or demand from the larger grid.

Han said moving away from the idea of central control avoided the challenges of communications technologies dropping out at crucial moments.

"We tried to find an evenly distributed way of control, and also co-ordinated control."

He said using a probabilistic approach allowed them to get around the challenges of intermittent supply. They dictated the amount of risk of failure they were willing to tolerate in the system and let the mathematics determine how to manage the supply.

The increasing use of battery systems for



electricity storage will also play a key part in maintaining a steady supply across the whole of eastern Australia and beyond.

"With our methodology we want to use the existing network — that's how we've tried to reduce the cost," he said. Some \$36 billion is slated for network upgrades in coming years — just to maintain the status quo. But Han said their system will be more cost-effective and would allow increased use of renewable energy.

This would prevent the need for new power stations, realizing further savings, and help to address climate change.

Peter Wolfs, one of Han's collaborators from Central Queensland University, said even if the system is not adopted by the grid, the system has application on smaller scales.

"Universities have electricity bills in the millions of dollars each year. With advanced networked control and battery storage, they could make better decisions about when to sell their electricity into the grid." ■



including allocations," said Chalmers. In an audit of existing water reporting processes the researchers found a patchwork of methods in which some water users were not considered.

Chalmer's team established a collaborative process involving hydrologists, engineers, water-users and policy-makers. The outcome was a rigorous method to report water stocks and flows.

"The concept is really similar to general-purpose financial accounts; you have a balance sheet that identifies water assets and liabilities," said Chalmers.

The Bureau of Meteorology now publishes its annual National Water Account for the ten nationally significant water regions in Australia, including the Murray-Darling River Basin using the principles of general-purpose water reporting.

The approach has had an influence globally as well, with the team's ideas contributing to an emerging international discipline of water accounting.

Water accounting methods will be integral as society is forced to manage its water resources more carefully. ■