The ecosystem’s the thing
Wood as strong as steel: new breed of timber towers
Revealed: brain ‘switch’ tells body to burn fat
Welcome to the Go8’s October newsletter

Since our last newsletter, it would surprise no-one to know that the Go8’s time has been largely consumed explaining publicly and to our politicians why the Federal Government’s proposed funding cuts to Universities are way past the tipping point where we can absorb them.

It is so important we never ignore that this battle has two fronts, not one. We fight on behalf of the direct planned additional financial impost on our students. It is absolutely unaffordable for them in today’s economic climate and housing price bubble.

And we also fight on behalf of the indirect planned additional financial impost on our students which occurs when our universities are impacted and students end up paying more for less. Our students know all this to be true, and are saying so as volubly as the Go8.

In a recent speech https://go8.edu.au/article/go8-chief-executives-speech-university-governance-and-regulations-forum-canberra (one described by Fairfax media as “passionate” which I believe it most certainly was) I set out that after 17 years in the sector I found myself at a loss to understand what our current government wants and expects from our sector. I am at a loss about why this Government, which just two years ago, and with a new Prime Minister, was committed – as a priority – to everything our sector stands for; is now, instead, working against the success of everything we stand for.

And it should be noted here that the government’s $2.8 billion in proposed cuts to universities is nearly triple the size of its investment in the National Science and Innovation Agenda.

So, as we await the Government’s decision on whether to test the legislation in the Senate (or not) when it sits again on 16 October, we have been noting with interest, and immense regret, how much Universities here and around the western world appear to have become collateral damage in a battle that is called various things but most often a fight against “the elites” – a “fight” that has seen disruptions such as the rise of Trump, and the advent of Brexit.

At home in Australia, the value of Universities to our economy and to our society is just not understood by the broader community – and this is despite the fact that every single person in the population benefits every day from the education and research we provide.

I have been saying for some years that it should never be forgotten – you do not need to go to University to benefit from what we do in education and research.

For that reason, this October issue – apart from our usual uplifting short research contributions which encapsulate so well in each newsletter what we do – is devoted to commentary from here and overseas on this dismaying and unhelpful depiction.

We have the view of Alistair Jarvis who was recently appointed Chief Executive of Universities UK which represents 136 UK Universities. As you will read, he is strong in his view that it is time Universities fought back. Locally, when the Founding Director of the Australian Institute for Family Studies Don Edgar speaks out, people listen. We republish some of his direct, sensible, interesting perspectives on the value of a university education.

We also include a fascinating read that discusses such value from California, home for the next few months to Fulbright scholar Dr Gwilym Croucher from the University of Melbourne. Dr Croucher is a much-valued member of the Go8 community. He has seen the value of the university system to Silicon Valley and sets out exactly what Australia should never forget in terms of valuing the sector’s contribution, and funding it accordingly.

A stretched system will have ramifications.

From my own perspective, I have recently returned from India in August and am soon to head for China in November; two nations where the Go8 has built strong and much valued relationships. These nations so value universities and make it a priority to embrace what they offer. They know universities are key to a much-desired, striven-for future for both the economy and the individual, so it is hard to understand why this contrary view is occurring in Australia and around the western world to varying degrees.

That old expression “never bite the hand that feeds you” springs
to mind because just imagining how we would manage in a nation deprived of the results of higher education is an ugly vision.

On a more positive note I was pleased to be part of the “Global University Engagement Summit” hosted by the University of Melbourne with the Go8 in September. It brought together more than 25 thought leaders from seven countries. It enabled us to take the time to, together, discuss and debate the strategic importance to our universities of reshaping relationships with government, industry and community.

To quote Professor Glyn Davis, Vice Chancellor of the University of Melbourne “each university represented carries its own story of mission, engagement and impact. With great reverence to the traditions these bring, each generation of leaders must make choices to shape their university for its time, giving new form to enduring missions. Ultimately the sustainability of every publicly spirited institution depends upon continuing relevance and value to the communities it serves.” Universities take that ethos very seriously. We only ask that our current Government do likewise.

**VC Views**

**Professor Peter Høj**
Vice Chancellor, University of Queensland

This year an international leader in commercialisation of innovation made its first pledge to invest outside its traditional markets of the UK and USA. IP Group could have invested in any number of regions, but it chose our part of the world, and is banking at least $200 million on researchers and innovators at the Group of Eight universities and the University of Auckland.

Why? Because this experienced company sees our universities as sound investments. As do others – including investors from Singapore, the USA, the UK and Australia, who are partners in this enterprise.

Who can blame them? Go8 universities are the source of inventions ranging from the world’s first cervical vaccine, the ‘bionic ear’ and the world’s first successful, non-invasive sleep apnoea treatment; to solar cells with world record-breaking efficiency and ‘green steel’ technology that has helped turn millions of old car tyres into high quality steel.

Universities have shown we have what it takes to contribute to national prosperity and social cohesion. We have worked with business and industry to shift products of excellent research out to the community. Universities have fuelled jobs and wages growth, and when 1000 graduates enter the workforce an estimated 120 jobs open for people without degrees.

Today, many bright young Australians of diverse backgrounds aspire to both study at university, and try their own enterprises. We are opening new channels for their entrepreneurial instincts, so that more Australians are encouraged to thrive in the age of disruption.

Universities are ready to do much more. If allowed to continue building momentum, we will go on generating jobs, growth, and innovations of which all Australians can be proud.

Why sell down a high-performing asset that international experts admire? Why take a risk on a senseless package of cuts that will, at the very least, squander opportunities for continued growth and prosperity?

If you have a chance to express opposition to the government’s plan, then use your chance. It will make a difference, and future generations will thank you for your foresight.

**Professor Glyn Davis AC**
Vice Chancellor, University of Melbourne

Proposed changes to Commonwealth supported graduate places will not be good for students or most universities. While there is general agreement a new allocative approach for postgraduate places is needed, a postgraduate voucher system is not the answer. It tries to rein in the costs of the ‘demand-driven system’ without addressing fundamental questions of value.
The current plan is unworkable. It does not deliver student choice, it creates new levels of red tape, removes the certainty necessary for universities to plan year-to-year, damages pathways between undergraduate and graduate education and will damage Australia’s internationally well-regarded graduate education market.

There are ways to allocate postgraduate places more effectively that ensure alignment with the workforce of the future, address student choice and encourage diversity within the sector. The Government should remove the postgraduate provisions from the Bill, consult the sector, and return with a revised scheme when crucial operating details have been properly worked through.

Changes to one part of Australia’s post-school education sector affects others. There is a real opportunity to rethink the shape of Australia’s post-school education system, but it requires government to apply design thinking to the system.

The Bill as proposed does not address the underlying problems: the costs of the demand driven system, revisiting participation goals in the light of regional needs, and a regulatory framework that is a patchwork of incomplete reform. The Bill also fails to address the vital nexus between vocational education and higher education and the need for the two to be integrated and complementary.

The University of Melbourne is proposing a systems approach to reform that could deliver a more mature version of the demand driven system. One way to do this would be to allocate a maximum number of Commonwealth supported places to an institution, following a dialogue about community needs, local labour markets and university goals.

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Professor Margaret Gardner AO
Vice Chancellor, Monash University

To a government fixated on budget repair, most of the costs of university sector programs and operations are tangible and immediate, while many of the benefits are seen as deferred and indirect. But they are essential to the nation’s future. The successes and strengths of Australian universities are reflected in:

- global rankings that rely on the sector’s solid research and educational performance
- delivery at scale of workforce skills and credentials to citizens and the labour market
- a flagship role leading a major service export industry, and
- their hub role as enablers and incubators for Australia’s future economy.

It is convenient for government to pretend that these benefits will continue to flow in full, regardless of any damage done by market shifts, funding shortfalls or policy missteps.

Professor Ian Jacobs
Vice Chancellor, UNSW Sydney

Planned funding cuts to the higher education sector are of major concern to Australia’s universities and in particular, their students. Make no mistake, these proposed funding cuts will hamper Australia’s competitiveness at a time when the nation is perfectly positioned to be a global leader in the 21st century knowledge economy.

On an individual level, these funding cuts would place unnecessary financial burdens on students, and act as a deterrent to higher education for many talented young people.

At a national level, these proposed cuts are short-sighted and quite simply not in the nation’s best interests.

Higher education, both teaching and research, is at the heart of Australia’s economic success. Universities represent a huge return on investment for the Australian Government and any plans to cut investment in this area is counter-productive and dangerous for the economic health of the nation.

Australia’s universities are increasingly efficient and highly competitive internationally. They sit at the hub of a progressive, outward-looking nation.

Education and major institutions providing it are generational assets, embedded deeply in the social, cultural and economic machinery of the nation and worthy of investment.

I urge the Government to reconsider its proposed cuts to higher education and to realise that investment in universities is an investment in the future prosperity of Australia.

Dr Michael Spence AC
Vice Chancellor, University of Sydney

If the Senate passes the Government’s reform Bill, students will pay more but universities will receive less to invest in the quality of their education.

At the University of Sydney, we face cuts of more than $50 million over the next four years.

At the same time, the Government is cutting the last dedicated source of federal funding available to help Australian universities create transformational teaching and research infrastructure.

Inevitably, these cuts will place further pressure on our ability to invest the quality of our teaching and student support services.

Beyond the impact of the funding cuts, the proposed reforms will do nothing to improve the system’s coherence or address the many perverse incentives that currently threaten its quality and sustainability.

Many of the proposed measures will add further complexity and uncertainty to a funding system that is already far too complex. One of them will actually force us to close or restructure highly successful courses that
IP Group could have invested in any number of regions, but it chose our part of the world, and is banking at least $200 million on researchers and innovators at the Group of Eight universities ...
There have been many attempts to emulate Silicon Valley’s almost irresistible promise of employment and economic growth without relying on primary industry or low cost manufacturing. The benefits it has brought are clear. Over the last eight decades the contribution of technology companies to economic growth means they are at the centre of the San Francisco Bay Area’s $722 billion GDP (2016).\(^1\)

Technology companies have contributed to the growing wealth of not just California but in no small part the USA and further afield. Businesses formed by Stanford alumni alone are estimated to contribute $2.7 trillion to world revenues, having created 5.4 million jobs since the 1930s.\(^2\) If the exact contribution is even a fraction of this, the benefits are undeniable.

Few communities would turn this down, even if it has come with the challenge of greater inequality through many cities close to Silicon Valley. As engines of prosperity and wealth, the success of the Silicon Valley is credited to the legion of innovators, entrepreneurs and garage tinkerers whose success comes through their ingenuity. The tech boom would not exist without their ambition, yet their contribution alone is not the whole story.

It is the ecosystem that is the thing. The success of Silicon Valley’s entrepreneurs relies largely on a whole ecosystem to sustain and enable innovation. The San Francisco Bay Area has the right mix of venture capital, a adaptable legal system, Federal research funding, support from state government, and education and research at leading universities. That, and most people like the weather.

This ecosystem took decades to develop and was built following continued US Defense Department funding for basic research at university laboratories. A sustained effort by many, very smart people to ensure that the technologically possible could be more than just wishful thinking.

Government has had an important role as enabler. While this role has at times been more about getting out of the way than be actively involved, it has been more proactive than recognised, especially through higher education. The Californian education system and its public universities are a key part of the ecosystem making Silicon Valley so effective. The contributions of Stanford and the University of California Berkeley as engines of basic and applied research are widely celebrated as sitting at the heart of the success. Stanford’s Research Park in Palo Alto is the home for many of the innovative ventures since it was established in 1951. What is sometimes less recognised is the critical role local higher education plays in providing the workforce.

Silicon Valley is a magnet for international talent with many people coming with significant experience. But this can be deceiving. The largest provider of engineers in Silicon Valley is San Jose State University. This university of over 32,000 students is located in the heart of tech boom. It is the oldest public university in the region founded in 1857 and is a part of the Californian State University System (CSU) which does not

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1 BEA  2 Eesley and Miller
offer doctoral programs. San Jose State carries out excellent research and hosts some national research centres, but the scale of this is modest. What the college excels at is teaching, and helps provide the workforce of engineers that makes Silicon Valley possible and keep it ticking.

San Jose State, along with other public colleges in California provides a lot of the ‘doers’ and this has some people a little worried. The public universities have historically done well, those part of the multi campus University of California (UC) are ranked with the top public universities in the world, and CSUs, those not having doctoral programs, are consistently rated as providing some of the best education in the US.

But all these public colleges are increasingly stretched. Public universities in California rely on state funding that has decreased significantly in recent decades. CSU enrolments have grown 28 per cent since the 1990s yet the total funding has decreased by 14 per cent in real terms. The UC research campuses have been strained further, having grown enrolments 40 per cent yet suffering an overall reduction of 26 per cent in real terms. Financing teaching increasingly relies on cross subsidisation from non-state sources. There are some hard limits to this though as current state rules cap the number of out of state and international students paying high fees. Philanthropic contributions for day to day education provision are at times hard to come by, especially for the less prestigious CSUs.

As the public universities get pushed to the limit – with class sizes increasing and quality dropping – it may have an effect on the whole ecosystem of Silicon Valley. Without these graduates companies will have to look elsewhere. With living costs in the San Francisco Bay area some of the highest in the world, it is getting harder to attract lower paid, recent graduate engineers from out of state. It is doubtful that Stanford, a private non-profit university with around 7,000 undergraduates can alone provide the local workforce.

According to the news it may seem at times as if Elon Musk is solely responsible for driving innovation in Silicon Valley but it is the ecosystem that counts. (Although Musk is pretty important). It is the interdependence of industry, government and higher education that is critical to its success.

There are lessons in this for policy makers when it comes to higher education. Universities around the world still overwhelming relying on public support with few countries having a truly private system. Universities play a critical role in training workforces. Where government stretches these public institutions, policy makers need to think carefully about the unintended consequences. As Silicon Valley shows, their role is not always fully acknowledged yet critical as part of the broader ecosystem. Put them under too much stress and we may be unpleasantly surprised by the results.

Dr Gwilym Croucher is a 2017–18 Fulbright Scholar and currently a Visiting Research Fellow at UC Berkeley. He is a higher education policy analyst in the University of Melbourne Chancellery and researcher in the Melbourne Centre for the Study of Higher Education.

CSU enrolments have grown 28 per cent since the 1990s yet the total funding has decreased by 14 per cent in real terms.
The recent media entry into the higher education debate of Don Edgar, the sociologist founder of the Australian Institute of Family Studies, should have sounded a loud warning bell to a Government seemingly deaf to angst from all quarters about its lack of commitment to a coherent higher education policy and adequate funding.

The Go8 republishes some of Don Edgar’s remarks which first appeared in *The Australian*.

The notion that education is a private rather than a public good feeds on a false dichotomy. It is both. Yet the prevailing orthodoxy – accepted by both sides of politics – is that because getting a university degree supposedly leads to better jobs and higher incomes, the individual graduate should pay back the money governments have invested in that university education.

Notice the slippage here. Governments believe that education is a good investment, presumably in the economy as a whole, but the individuals who work hard to further their capacities and thus their contributions to the economy, those who in fact personally invest years of effort while they forgo earnings, should pay back some of that investment because they are benefiting.

What of progressive taxation? If a degree leads to a higher income, you should be paying higher tax. And the whole purpose of a tax system based on income brackets is so the better-off subsidise, help pay for, the education and welfare of those less well off in society. It’s not just a direct investment, it’s an indirect way of fostering the talent too often left to stagnate among the disadvantaged.

If we don’t invest in that advanced learning, we risk becoming Keating’s white trash of Asia. And those full fee-paying Asian students crowding our university classes won’t be able to stay here and boost our economy, they’ll go home and benefit theirs.

So let us refocus the education debate. Call out those who claim having a degree is an individual luxury. Ask them who is teaching their kids. Who is doing their accounts? Who is caring for them in hospitals and surgeries? Or inventing new technology, new jobs, new futures for this country?

And ask whether the investment we made as taxpayers was worthwhile in itself as a public good, or whether instead students should be punished by loan repayments, forced to delay buying a house, starting a family or building a new business.

What do economists who study cost benefits say about that?

Education Minister Simon Birmingham is being ingenuous when he says: “Less than half of all school-leavers go to uni so that’s a lot of taxpayers providing funding for a public good”.

The parents of those who do go to university are also paying taxes, and those whose children don’t go to university all benefit from the schoolteachers, doctors, nurses and others who have university qualifications. Every taxpayer contributes and every taxpayer benefits.

“Less than half of all school-leavers go to uni so that’s a lot of taxpayers providing funding for a public good”.  

Let us refocus the education debate
The information in the silence: tapping into the sense of touch

In August, Alistair Jarvis was appointed Chief Executive of Universities UK (UUK) which represents 136 universities in the UK and Northern Ireland. UK Governments have been continually more receptive to the need to financially support universities, especially their research capability, than the Australian Government. However post Brexit, UK universities are facing the same themes of disparagement and alternative facts as their Australian counterparts.

Universities are under intense scrutiny and in danger of being unfairly categorised as elite, aloof and detached from individuals, communities and day-to-day challenges.

In a first major speech on 29 August, Jarvis confronted the issues directly. Here is an introductory excerpt and a link to the thought provoking full speech. It is indeed food for thought.

Universities are under intense scrutiny and in danger of being unfairly categorised as elite, aloof and detached from individuals, communities and day-to-day challenges.

In the UK, it seems to be open season on universities. Whether it is attacks on the value of a degree, problems with the tuition fees system, senior staff being overpaid, or problems with international students, universities are this summer’s scapegoat of choice.

Whether it is open season or silly season, it has attracted the attention of some prominent commentators, who have taken time out from their summer breaks to catalogue the litany of failings in our university sector. While universities should certainly be scrutinised and held to account, much of this criticism has been based on little in the way of evidence or context. Indeed, some attacks have lacked any factual accuracy at all. We’ve seen a post-truth summer of misinformation, muddled argument and even a little malicious intent.

Let’s see if we can follow a post-truth summer with an evidence-based autumn. Universities are not in crisis, they are positive and powerful institutions delivering deep and lasting value to communities in all corners of the world, but universities do have some serious reputational issues that need addressing.

It is time for universities to address this crisis of confidence. We have a major challenge. Now is the moment for universities to shine and prove their value. Today, I want to issue a rally call... It is time to fight back...

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Alistair Jarvis

As he studied architecture, and grew increasingly aware of the challenges of climate change and population growth, Oldfield became part of a group spearheading a movement aimed at designing tall buildings that are sustainable, green and welcoming to live in. This “high-performance architecture”, as he calls it, is a crucial aspect of UNSW’s Master of Architecture program.

One thing is certain, Oldfield says, the world’s exponential population growth and a rise in urban living mean more and more of us will be living in high-rises as well as working in them. “So we might as well try to get it as right as we can.”

Oldfield’s upcoming book, The Sustainable Tall Building, highlights the possibilities. There’s a timber-clad, family apartment in a Norway high-rise, a soaring, sun-splashed, vertical school in a New York skyscraper, and a seven-tower residential block in Singapore linked with green walkways, that includes a sky-high running track, a children’s playground and lush hanging gardens.

The use of timber has been embraced to build commercial buildings, which have a much lower level of “embodied carbon” than conventional buildings, making them far more environmentally friendly. This happens because trees absorb carbon dioxide from the air through photosynthesis, and so timber has the ability to store carbon and remove it from the atmosphere.

“My research is showing that materials typically equate to 33 per cent of all the carbon emissions of a tall building. So if we build them out of timber, we can dramatically reduce their carbon footprint, creating sustainable powerhouses,” Oldfield says.

The trend has been enabled through a breakthrough in the manufacture of extremely strong wood known as mass timber. This involves laminated timbers being glued together at right angles under extreme pressure to form giant pieces of wood. These can be as equally strong as conventional building materials such as steel.

The timber pieces are typically up to 40cm thick, but have been proposed to be made up to 2.5m thick, and 2.5m wide.
Builders have increasingly begun considering using this heavy-duty engineered timber, prompting the moniker ‘plyscrapers’.

The safety of high-rise buildings has always been an issue, highlighted by the tragic Grenfell apartments fire in London. Yet as counterintuitive as it sounds, this engineered wood can be just as safe – if not safer – than steel, in a fire.

“Steel starts to lose its strength at 550 degrees Celsius, after which it will just buckle and collapse. By contrast, engineered timber has been manufactured in a way so that the exterior chars, leaving the core of beams and columns intact, and people inside the building have time to get out.”

The good news is Australia is leading the way when it comes to rethinking our skylines.

Designed by Alec Tzannes, former Dean of the UNSW Faculty of the Built Environment and one of Australia’s most respected architects, and Jonathan Evans, the soaring, light-filled space with its colonnade of recycled iron bark timber, is a hymn of praise to wood. And it has impressive green credentials. By not using concrete, thousands of tonnes of greenhouse gases were avoided.

“These new high-rises are going to totally transform buildings that have traditionally been seen as gas guzzlers. It’s a “new form of beauty” according to Tzannes. “Normally, building sites are full of dust that gets in your eyes. But when you walk out into this building, it smells like a pine forest,” he says. “It’s like entering another world. When you look out to the more conventional buildings all around, it’s all the more beautiful. It recreates the beauty of historic buildings in the past.”

The mass timber panels, grown in sustainable forests in Austria, were prefabricated, craned on to the site, then slotted and screwed into place by a small construction team. Having been recently tenanted by Lendlease, Tzannes regards the building as a commercial trailblazer. “It is proving to the commercial real estate market that mass timber construction is a viable alternative to conventional concrete construction.” Buildings like International House Sydney, Forte Apartments in Melbourne, and the upcoming King Street

Yet as counterintuitive as it sounds, this engineered wood can be just as safe – if not safer – than steel, in a fire.
Wood as strong as steel leads to new breed of timber towers

A classic example is 1 Bligh Street in Sydney, a modern office overlooking Circular Quay. Its wide, north-facing steps provide a sunny public space where office workers can sit and enjoy lunch. Pedestrians can cut right through the 40-storey atrium, using it as a public thoroughfare.

“Part of the problem in Australia is that, up until now, we have designed tall buildings for the economy – simply as income generators – rather than thinking about communities or sustainability,” Oldfield says.

Yet the new tall towers are actually a lot more economically viable than their predecessors, as well as being good for the environment, he says.

“The Australian building industry is increasingly seeing the financial benefits of timber buildings. They are pre-fabricated in a factory, craned on to the site, and put together like a giant piece of IKEA furniture. The workforce needed is smaller, and the process is a lot safer.”

Already, several 20-storey buildings made out of timber are being built in Scandinavia and Canada. A timber tower up to 85 storeys high is also being planned for London.

“It’s a matter of helping people to think differently. We need to think about the big picture.”

The Sustainable Tall Building: A Design Primer, by Philip Oldfield, will be published in 2018 by Routledge.

“High-rise buildings should be more than just machines for living in. Ideally they should form part of the fabric of the city, and be able to make a difference socially and civically,” Oldfield adds.
A University of Sydney and New York University study details the effects of luminance on the quality and consistency of our financial decision-making.

Luminance is a measurement of the amount of light that falls on the earth's surface, which can be affected by cloud cover, humidity, suspended particles, and time of day and year.

Researchers already know luminance affects behaviour, with sensors in the human retina carrying continuous information on light levels to the hypothalamus, a section of the brain which regulates functions such as hunger, sleep and sex drive.

The University of Sydney's Associate Professor Agnieszka Tymula is the corresponding author of a new study published in PLOS ONE, which adds to existing knowledge by investigating how luminance affected 2,530 people's decisions about monetary gambles.

Luminance also affected people's risk attitudes.

When the luminance level was high people were more likely to avoid known risks. When offered a choice between a certain $5 payout and a 50 per cent chance of $20, they were more likely to go for the certain $5.

Surprisingly, they had greater tolerance for unknown risks. On high luminance days, they were more likely to go for an unknown chance of getting $20 over the certain $5 payout.

"On the days with higher light intensity, people made worse decisions and they were more inconsistent in the choices that they made." – Associate Professor Agnieszka Tymula

Overall, the effects are not of an enormous magnitude, but nevertheless they are consistent, significant, and strong enough to be expected to have significant effects on financial markets.

Associate Professor Tymula and her co-author, Professor Paul Glimcher of New York University, asked people to make 40 monetary decisions, using touch screens mounted at an exhibition on ageing at the National Academy of Science Museum in Washington D.C.

In each situation, people could choose a certain payout of $5, or a lottery option with the possibility of receiving nothing, or a cash amount between $5 and $125.

Behavioural data from the responses received at the museum was then merged with luminance measurements from a nearby weather station.

The researchers found that luminance affects decision-making in different ways, with higher and lower levels of light intensity found to affect how much risk people can tolerate, how comfortable they are making decisions in ambiguous situations, and how consistent their decisions are over a range of choices.
Revealed: brain ‘switch’ tells body to burn fat after a meal

Dr Garron Dodd and Professor Tony Tiganis

Scientists at Monash University’s Biomedicine Discovery Institute have found a mechanism by which the brain coordinates feeding with energy expenditure, solving a puzzle that has previously eluded researchers and offering a potential novel target for the treatment of obesity.

Obesity — a major risk factor for many diseases including cardiovascular disease, Type 2 diabetes, liver disease and several cancers — is at epidemic levels in Australia.

Researchers from the Metabolic Disease and Obesity Program have shown in laboratory models that feeding controls the ‘browning’ of fat, that is, the conversion of white fat, which stores energy, into brown fat, which expends it. Fat in the human body is stored in specialised cells called adipocytes, which can change from white to brown states and back again.

Their study, published in Cell Metabolism today, shows that after a meal the brain responds to circulating insulin, which is increased after a rise in blood glucose. The brain then sends signals to promote the browning of fat to expend energy. By contrast, after a fast, the brain instructs these browned adipocytes to once more convert into white adipocytes, storing energy. These processes help prevent both excess weight gain and excess weight loss in response to feeding and fasting, meaning body weight remains relatively stable over time.

The researchers showed that the brain’s ability to sense insulin and coordinate feeding with energy expenditure via browning is controlled by a switch-like mechanism turned on after fasting to inhibit the response to insulin, repressing browning and conserving energy, and turned off after feeding to facilitate the insulin response to promote browning and to expend energy.

“What happens in the context of obesity is that the switch stays on all the time – it doesn’t turn on off during feeding,” lead researcher Professor Tony Tiganis said.

“As a consequence, browning is turned off all the time and energy expenditure is decreased all the time, so when you eat, you don’t see a commensurate increase in energy expenditure — and that promotes weight gain,” Professor Tiganis said.

Previous investigations by the researchers that showed how the brain coordinates white adipose tissue browning attracted considerable attention after it was published in early 2015.

“For a long time, the missing piece to the puzzle was always why this occurs in the body,” first author Dr Garron Dodd said.

“We’ve shown not only why this occurs but also the fundamental mechanism involved. It’s very exciting,” Dr Dodd said.

The researchers are further exploring the possibility of inhibiting the switch for therapeutic purposes to promote the shedding of excess fat.

“Obesity is a major and leading factor in overall disease burden worldwide and is poised, for the first time in modern history, to lead to falls in overall life expectancy,” Professor Tiganis said.

Potentially we may be able to rewire this mechanism to promote energy expenditure and weight loss in obese individuals.

“Obesity is a major and leading factor in overall disease burden worldwide and is poised, for the first time in modern history, to lead to falls in overall life expectancy,” Professor Tiganis said.

Researchers from Germany collaborated on the study.

This research was supported by the Australian National Health and Medical Research Council.
DNA fingerprinting has revealed how the malaria parasite shuffles genes to create different strains and hide from our immune system. This trick allows the parasite to remain undetected and re-infect the same people, much like the flu.

A study involving more than 600 children living in a small village in southeast Gabon, near the border with the Republic of Congo, found that each infected child in one African village had a different strain of the malaria parasite and a distinctly different set of the up to 60 genes that the human immune system focuses on to detect and control this infection.

The findings help explain why people can’t develop immunity to malaria and indicate that control programs should now focus on looking at the impact not just on the number of infections but the structure of diverse strains of the parasite.

The University of Melbourne and the University of Chicago, with a team of scientists from the US, Europe and Australia, have published this research in the journal PNAS.

“We produced a genetic fingerprint of malaria parasites from small amounts of blood based on what are called var or variant antigengenes. These genes encode proteins that coat the surface of the red blood cells when infected by a parasite, and are important because they allow the parasite to disguise itself from the human immune system,” added Prof Day.

The malaria parasite is a single-celled microorganism (known as a Plasmodium) that infects red blood cells and is transferred from human to human via mosquitoes. Every parasite has approximately 60 of these var genes and can switch between them.

“Looking down the microscope you would think all of the infections look the same, but when we did the genetic fingerprinting with this variant antigen gene system, we could see that every child had a different parasite fingerprint, and importantly, each fingerprint was highly unrelated to all other fingerprints.”

“Our results show that the parasite has evolved this enormous diversity with limited overlap between the sets of var genes. This structure allows...
Study shows how malaria hides from immune system continued

This structure allows each parasite to look different to the immune system, and provides the possibility for the malaria parasite to keep re-infecting the same people because it exists as different “strains” that can persist for many months.

Computer analyses of the variation in these sets of genes and how they might respond to control efforts with anti-malarial drugs showed that these patterns were not random. The extremely high level of diversity helps explain how the parasite evades its host’s immune system.

The non-random pattern has “implications for the success of malaria-control programs,” the authors note. It supports the notion that a large number of strains of the disease, each characterized by a significantly different combination of surface-coat proteins, could result in many children remaining infected even after aggressive efforts to intervene, such as mass drug administration.

“If strain theory is correct,” said study author Mercedes Pascual, PhD, professor of ecology and evolution at the University of Chicago, “we would want to rethink how we approach treatment for malaria in regions such as Gabon, where multiple highly diverse strains are the rule. Also, we would need to rethink how we model malaria transmission, rather than relying on existing mathematical models designed for a much less diverse parasite population.”

“There are tens of thousands of different var gene types,” Pascual said. “Some are conserved and others are highly variable.” Are parasites basically random combinations, a random mixture, of all this variation, or are they instead different combinations with a special structure? When she and colleagues analyzed gene sequences of multiple parasite they found a structure of minimal overlap, far less than expected.

“They form niches,” Pascual said. “They diversify. Through evolution they distance themselves from each other, so that they do not compete with each other for hosts. This opens the way to a better understanding of the parasites’ success, a clue to help us disrupt its persistence,” she said. “But it can be difficult to intervene in a system with such a diverse ensemble of strains.”

The researchers are now var code fingerprinting and modelling malaria strains in larger human populations through time. Dr Kathryn Tiedje, a researcher in Professor Day’s team at the University of Melbourne and one of the study authors, is currently looking at how control methods might impact the diversity of malaria.

“Will reducing the prevalence of malaria in any way reshape the var gene diversity,” she asked, “and can interventions also reduce the number of malaria strains in the population.

“Ultimately, the question we all want to answer is, how can we defeat humanity’s most unrelenting enemy?”

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