

## Highlights from “Dietary strategies for improving metabolic health” Symposium

Live presentations by Dr Rebecca Huntley (Ipsos), Prof Manny Noakes (CSIRO), Dr Jane Muir (Monash University) and Prof Michael Fenech (CSIRO) can be viewed at [www.mla.com.au/symposium](http://www.mla.com.au/symposium).

# Metabolic health: the consumer’s perspective

Defying expectations may be the gateway to effective communications on weight management.

According to Rebecca Huntley, when it comes to dietary advice for weight loss, “to be successful, you need to defy expectation and avoid that ‘been there done that’ reaction”.

Consumer insights presented by Rebecca Huntley informed the way in which information in MLA’s latest brochure, the *Live Well Plan*, is presented. Her conclusions were drawn from her involvement in MLA’s studies on main meal practices; her work in the *Mind and Mood Report*; and focus groups conducted around the *Live Well Plan*.

*“That’s better (than) a recipe book. The one thing that did put me off my diet because I felt like I did have to cook the recipe.”*

Women, Cammeray

Three focus groups were conducted in women and men aged 40 to 55 years who were overweight and self-identified as being at risk of high blood pressure, Type 2 diabetes or high cholesterol.

Most participants expected weight loss dietary advice to be prescriptive, restrictive and difficult. They were surprised by the flexible, balanced approach and in particular, use of familiar ingredients, meals and cooking methods.

For many, their experience of weight loss diets had not been sustainable because it often required making different meals for

individual members of the family or shopping for unfamiliar ingredients and preparing unusual meals. The need for dietary advice to work for the whole family was critical.

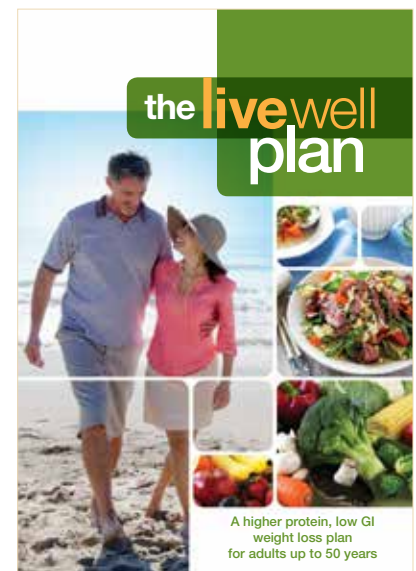
Exclusion of treats was another barrier to weight loss as many used alcohol and chocolate for stress relief, particularly in lower socio-economic areas. Rather than excluding all treats, they were more amenable to restricting the number of allowable treats and suggested connecting treats to exercise to either inspire restraint or encourage exercise.

Use of technical terms, such as ‘metabolic’ or ‘triglycerides’, was a clear turn-off and the meaning of different terms was interesting. For instance, women interpreted a ‘higher protein’ diet as having “no carbs” whereas for men, it had “no red meat, only chicken and fish”. Eating out was considered fine dining and an occasional treat, whereas take out refers to buying lunch during the week at work.

Most considered their diet to be generally healthy but recognised that they ate too

*“Since the heart attack there has been healthier choices made in eating. Every so often you have got to have your treat haven’t you? Everything in moderation. But as for a structured diet it’s just another thing to rebel against isn’t it?”*

Men, Hurstville



much. They were therefore most interested in clear direction around portion size. Even the men, most of which were in denial about the need to lose weight, were keen to follow this advice.

Importantly, they wanted intuitive, innovative ways of measuring “using things you are familiar with” such as the palm of your hand, tablespoons etc. Whilst they mostly liked use of real food to communicate dietary information, they specified that these images must present food in an appetising way.

Initially, participants were surprised that there were no recipes because they were expecting rigid meal plans and set recipes. After some discussion, they acknowledged that this new approach was refreshing and more likely to be sustainable. As expressed by one participant, it “gives you the mindset and shows you how to eat”. Providing meal ideas that are intuitive and build on familiar ingredients, cooking methods and utensils offers a new more meaningful approach for nutrition education around healthy eating.

# Higher protein, low GI diets

## – evidence and practical considerations

When it comes to translating evidence into practice, it is about what foods and how they are put together in dietary patterns that is important.

According to Manny Noakes, weight management is a quintessential component of improving metabolic health and it can be achieved using a number of different diets.

Higher protein diets have become more topical recently but they can mean many things. These include more extreme approaches consisting of carbohydrate restriction and high saturated fat intake to more moderate approaches which include low glycaemic index (GI) carbohydrates, similar to that of the *Live Well Plan*.

These more moderate dietary patterns include 25 to 30% energy from protein and 40 to 45% from carbohydrate, although it is important to note that in energy restricted diets, the percentage may seem higher than the actual amount of protein in grams.

Whilst most of the interest has focused on weight management, the higher protein, low GI dietary pattern has also been shown to be effective for reducing blood pressure<sup>1</sup> and improving glycaemic control<sup>2</sup> with several studies indicating no harmful effects on renal function in the context of weight management.

Perhaps the greatest benefit of the higher protein, low GI dietary pattern is around weight maintenance with the *DIAGENES* study showing that it was the most effective weight maintenance diet following initial weight loss (achieved using meal

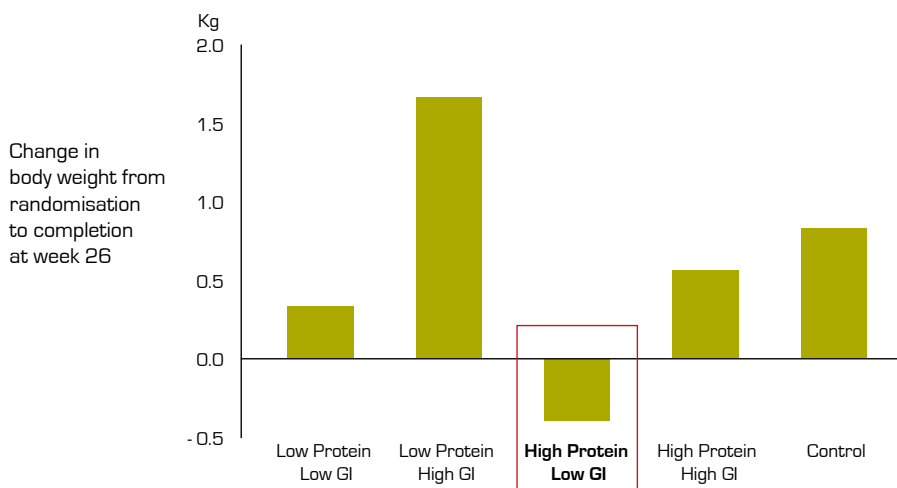
replacements).<sup>3</sup> This is possibly due to more favourable changes in satiety and maintenance of lean mass shown in a recent meta-analysis.<sup>4</sup>

The satiating effect is post prandial, occurring approximately three hours after consumption. So recommending more protein around times when people are challenged with hunger is potentially a helpful strategy.

There is some evidence that a low protein diet may drive overconsumption. According to the Protein Leverage Hypothesis our drive to consume the optimal amount of protein is stronger than our drive to balance energy. Put simply, we will continue to eat until our protein needs are met, regardless of energy intake. If this hypothesis holds true, including more protein earlier in the day might prove to be beneficial in reducing the desire to eat during the day, making it easier to reduce overall energy intake.

Whilst we tend to describe higher protein diets in terms of percent of total energy intake, absolute intakes are probably more meaningful. Recommended dietary requirements tend to be based on the amount of protein required to maintain nitrogen balance in a reference man and women i.e. g/kg body weight. Since the average body weight has increased, requirements may be higher.

### Most effective diet for weight maintenance (*Diogenes*)<sup>3</sup>



Planning meals		This is an example and will vary						
WEEKDAY EXAMPLE		meat	cheese	eggs	fruit	veg	stc	
<b>Breakfast</b>	Boat of high fibre, low GI cereal (30g) and low fat milk (200ml) topped with sliced fresh fruit (150g)				1	1	1	1
<b>Morning tea</b>	1 low fat yogurt (200g)						1	
<b>Lunch</b>	Wholegrain bread sandwich (2 slices) with canned tuna (100g), 1 slice (25g) reduced fat cheese, 1 cup salad and 2 tsp. mayonnaise spread	1	1	1	1	1	1	
<b>Afternoon tea</b>	1 piece fresh fruit (30g almonds & walnuts)						1	
<b>Dinner</b>	Beef stir-fry (150g) stir-fry strips, rice (weight), 1/2 cup cooked basmati rice, 2 cups cooked mixed vegetables, e.g. bok choy, carrot, mushrooms, capsicum and 1 tsp. canola oil	1			1	1	1	
<b>Total daily units</b>		3	4	2	2	5	3	

**TIP: combine units to make a portion**

- ✓ 100g lean beef strips + 1 cup cooked basmati rice = 2 units of meat alternatives
- ✓ 1 cup pasta = 2 units grains/cereals

Menu plan from the *Live Well Plan*

In addition, during weight loss, more protein may be required to maintain nitrogen balance which is perhaps why the higher protein diet may be more effective in preserving lean mass. Thinking about protein requirements in this way in terms of optimal health, rather than nitrogen balance, is perhaps a more useful method for considering protein requirements.

It is best to recommend a variety of protein sources to ensure nutrient requirements are met because different protein foods come with different nutritional profiles. The importance of protein foods as a source of nutrients other than protein is particularly relevant in energy restricted diets. Since many protein foods are important sources of iron, zinc and omega-3 in the diet, it is virtually impossible to meet nutrient requirements on low protein diets of around 15% of total energy.

### References

1. Rebolz et al. *Am J Clin Epi* 2012;176 (Suppl 7) :S27-43
2. Ajala et al. *Am J Clin Nutr* 2013 Mar;97(3): 505-16.
3. Larsen et al. *N Engl J Med* 2010;363(22):2 102-13
4. Wycherley et al. *Am J Clin Nutr* 2012;96(6):1281-98

# Dietary fibre and gut health: effects beyond the gut

Whilst dietary management of gastrointestinal clinical conditions have focused on gut-related outcomes such as bloating, stool weight and transit time, it may also have effects beyond the gut.

## Effects of gut inflammation on cognition and muscle

Chronic gut inflammation is involved in all of the main gastrointestinal diseases, including colorectal cancer, coeliac disease and inflammatory bowel disease which include Crohn's disease (CD) and ulcerative colitis. According to Jane Muir, it not only affects the way in which food is digested and nutrients are absorbed, but recent evidence suggests it may have systemic effects beyond the gut.

The gut involves complex interactions between the enteric nervous system and the immune system and in this way, links the gut with other organs in the body. Patients with CD have been shown to have a slower response time in cognitive tests compared to controls and when exposed to a muscle challenge, CD patients had a sharper decline in torque and hence higher muscle fatigue than controls. Fatigue is prevalent in many patients presenting with clinical gastrointestinal problems and once gut inflammation is controlled, fatigue is often reduced.

These effects may be mediated by circulating cytokines since they have been shown to raise pro-inflammatory IL-6 cytokines; lower serum vitamin D3, which is important for muscle recovery and lower serum Mg.

## A combination of dietary fibres is key

Within the gastrointestinal tract, dietary fibre plays a major role and is central to dietary management of gastrointestinal conditions.

Since different types of dietary fibres have different effects in the gut, a combination of dietary fibres has been shown to have optimal benefits. Combining wheat bran with resistant starch compared to wheat bran alone has been shown to produce more favourable luminal conditions in the distal lumen in terms of faecal weight, transit time and butyrate.<sup>1</sup> In patients with Irritable Bowel Disease (IBD), preliminary findings suggest increasing dietary fibre intake using a combination of wheat bran and resistant starch may help 'normalise gut function' in these patients in that it increased transit

time in those with a low transit time or slowed transit time in those with a fast transit time.

The type of fibre consumed will lead to adaptation of, and changes to, gut microbiota and subsequent changes in gut function, including production of short chain fatty acids (butyrate, acetate and propionate). Reduced intake of dietary fibres which have a prebiotic effect can reduce the proportion of 'good bacteria' such as bifidobacteria. This has been demonstrated in those following a low FODMAPs diet and highlights the importance of slowly reintroducing FODMAPs to the diet once symptoms disappear to maintain a healthy balance of gut microbiota.

## Dietary effects of dietary fibre beyond the gut

### Diets for reducing abdominal pain

The most common presenting problem of irritable bowel syndrome (IBS) sufferers is abdominal pain or discomfort which can be effectively treated with a low FODMAP diet. One of the causes of IBS is hypersensitivity

of the gut to luminal distension which results in pain mediated via the enteric nervous system. Restricting intake of FODMAPs results in less luminal distension and hence less distress and has been shown to be effective in reducing bloating and abdominal pain within 2 to 6 weeks.






### Systemic Anti-inflammatory effect

There is some evidence that Short Chain Fatty Acids (SCFA) may have anti-inflammatory effects systemically. Acetate and propionate, products of fermentation which can reach the peripheral circulation, may interact with the immune system via G-protein linked receptor (GPR43). This is an exciting and evolving area of research which may have important implications for inflammatory diseases, including asthma and even arthritis.

### References

- Muir JG et al. *Am J Clin Nutr* 2004; 79(6): 1020-28.
- Adapted from Eswaran S et al. *Am J Gastroenterology* 108, 718-727 doi:10.1038/ajg.2013.63

## Different dietary fibres, different effects<sup>2</sup>

					
Favourable effects	Soluble highly fermentable, SCC	Soluble highly fermentable, 'fibre'	Insoluble intermed. fermentable, 'fibre'	Insoluble slowly fermentable, 'fibre'	Insoluble intermed. fermentable, 'fibre'
<b>Laxation</b>	+	+	+++	+++	++
<b>Transit time</b>	-	-	++	+++	++
<b>Prebiotic effect</b>	+++	+	+	+	-
<b>SCFA</b>	+++	+++	++	+	-
<b>Some food sources</b>	Legumes, nuts, seeds, wheat, rye, onions, garlic	Legumes, rye, barley, oats	Oats	Wholegrain, cereal, rye, wheat bran, wholegrain, brown rice, quinoa	High fibre grains & cereals, nuts, seeds, skin of fruit

# Prevention at the genome level for health and longevity

Optimising diet and lifestyle factors to reduce DNA damage has the potential to slow aging and reduce risk of degenerative diseases.

According to Michael Fenech, DNA replication and repair is critical to life and DNA damage is ultimately what causes our bodies to age and to increase our risk of degenerative diseases.

Our capacity to repair DNA varies between individuals but also depends on how we behave and what we eat.

Whilst environmental genotoxins, such as ionising radiation and heavy metals, are well known exposures known to cause DNA damage, there is growing evidence that poor diet and lifestyle factors are also important.

Understanding how these factors increase susceptibility to DNA damage and ways in which to slow it down or increase repair pathways has the potential to slow the rate of aging and reduce risk of degenerative diseases.

This area of science is growing at an exponential rate with advances in techniques for measuring DNA damage. Various biomarkers for measuring DNA damage are at various stages of validation for measuring associations with health outcomes.

One of the most established markers is micronucleus frequency which has been used in several studies to demonstrate

positive associations between DNA damage and increased risk of cancer, cardiovascular disease and poor pregnancy outcome.

Such biomarkers are therefore important for not only understanding factors that cause DNA damage but also for determining a threshold of damage above which aging and risk of disease is accelerated. For instance, a five-fold increase in DNA damage associated with weight gain in children showed little difference between overweight and obesity suggesting a threshold around the upper limit of the healthy weight range.<sup>1</sup>

Results of a study in Japan suggest that the most important diet and lifestyle factors which may contribute to reducing DNA damage appear to be more sleep (at least 7 hours each day), more exercise (at least twice per week), working less hours (less than 9 hours per day), and more balanced nutrition (diet rich in fruits, vegetables, cereal, with moderate meat or fish intake). However, other factors such as smoking, alcohol intake and mental stress, can in contrast, increase DNA damage.<sup>2</sup>

Other nutrients that have been shown to modulate genetic stability biomarkers and processes include vitamin C, vitamin E, selenium, carotenoids, polyphenols, vitamin

B12, choline, zinc, magnesium, niacin, vitamin A, calcium, vitamin D, vitamin K and the omega-3 fatty acids.

Understanding the optimal level of intake is critical as there is some evidence that high intakes may be as damaging as low intakes. For example beta-carotene has been shown to be protective up to a certain level of intake, above which it actually increases damage.

The optimal level for each micronutrient may differ by age and even by genotype. For some, optimal intakes may be higher than those currently recommended. This may be relevant for those with an increased susceptibility to chromosomal damage where supplementation with 3.5 times the recommended daily intake (RDI) of folic acid and vitamin B12 was shown to reduce DNA damage by 25%.

This 'sweet spot' for preventing DNA damage has implications for research on nutrient reference values which have not previously considered micronutrient requirements in relation to optimizing genome stability.<sup>3</sup>

It also has implications for future diet and lifestyle recommendations. Whilst there is no doubt that our current advice on healthy diet and lifestyle is important, it is now possible to get personalised genetic information.

Whilst more research is required to match diet and lifestyle advice to an individual's genetic make-up, for now, these techniques are useful for ensuring that our dietary advice is safe. In this respect, it is reassuring that telomere length, a biomarker of DNA stability, was improved in men after 52 weeks following weight loss on either a higher protein, low GI diet or on a high carbohydrate diet.<sup>4</sup>

## References

- 1 Scarpato et al. *FASEB J* 2011, Feb;25(2):685-93
- 2 Huang et al. *Preventative Medicine* 2009;48:383-388
- 3 Fenech et al. *Am J Clin Nutr* 2010 doi:10.3945/ajcn.2010.28674D
- 4 O'Callaghan et al. *Rejuvenation Res* 2009;12(3):169-76

## Reversal of DNA damage following weight loss on a higher protein, low GI diet and a higher carbohydrate diet<sup>4</sup>

