

Committee Members for the Inquiry into the Role of Diet in Type 2 Diabetes Prevention and Management

Via Committee Chair

Education and Health Standing Committee

Legislative Assembly Committee Office

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Dear Committee Members

RE: INQUIRY INTO THE ROLE OF DIET IN TYPE 2 DIABETES PREVENTION AND MANAGEMENT

Metabolic Health Solutions Pty Ltd (MHS) welcomes the opportunity to submit to the *Inquiry into the Role of Diet in Type 2 Diabetes Prevention and Management*. MHS is a West Australian Metabolic and Digital Health Company pursuing markets worldwide. With significant operations and research collaborations in Australia and Europe, we are well researched and connected to understand the problem of Type 2 Diabetes Mellitus (T2DM). Successfully tackling T2DM and obesity in Australia is at the core of our ground-breaking work in our two clinics in Western Australia.

Summary Points

- T2DM is a metabolic disease that can be better tackled (along with obesity) for intervention, management and prevention.
- It is a costly disease that may be estimated to cost the state two billion dollars annually, it places a high burden on the hospital system, and has a devastating personal cost for patients and their families.
- Restrictive diets are effective for T2DM intervention and management as a part of lifestyle modification.
- Restrictive diets are effective for T2DM prevention (based upon metabolic measures) as a part of lifestyle modification.
- A key success factor is individualisation of the approach for the patient and adherence which is improved when a patient can see the metabolic changes from a restrictive diet.
- West Australians currently do not have widespread access to metabolic measurement that assists health professionals to manage our metabolisms and use restrictive diets more widely.
- Between forty and sixty percent of WA's T2DM patients could be put into remission and others could delay or be spared complications.
- Up to sixty percent of the state's population is at risk and could be spared developing T2DM.
- There is a role for state policy to build on the 'Live Lighter' initiative to promote metabolic health and other regulatory measures to promote restrictive diets for T2DM prevention, intervention and management.

Submission Detail

MHS has commercialised lower cost metabolic measurement technology to better clinically manage obesity, T2DM and other metabolic diseases. The technology has been validated with Curtin University and overseas institutions and is certified for therapeutic use as a medical device by the Therapeutic Goods Administration.

Even though one can be thin and get T2DM, clearly obesity and T2DM are linked. The link is that they are conditions that are both caused by metabolic dysregulation where fat accumulates where it is not wanted or should not be. This can be better addressed than it is today on an individual level using metabolic measurement based-lifestyle treatment.

Our technology gives three key parameters for a patient useful for managing metabolic disorders like T2DM.

- Firstly, we can measure the calories that a person needs for basic bodily function each day.
- We can then determine what proportion of those calories are from fat or carbohydrate and how 'metabolically flexible' a person is.
- Finally, we can get a measure of their 'mitochondrial efficiency' or (essentially) how efficient and fit their body's cells are.

This may sound complex but of these three parameters, one is estimated and two are ignored in conventional diabetes and obesity (metabolic health) management. This is not because they are not useful, but rather because they are not readily available for clinical or allied health use. MHS is changing that.

Our clients include major research institutions in Europe and a growing network of clinicians. We have a great interest and experience in lifestyle management including restrictive diets and exercise prescription for T2DM and was recently invited to participate at the Swiss Re Institute meeting on reversing T2DM¹ to ensure that we are connected and informed about the latest developments in this area. At that meeting, a number of programs presented from around the world all demonstrating a success rate of between forty and sixty per cent to reverse the course of T2DM.

We have taken our technology and applied it to about 1500 Western Australians to develop clinical protocols to tackle the most common metabolic disorders. It is similar to the technology afforded to journalist Julia Belluz to diagnose her weight loss in her article: "***What I learned about weight loss from spending a day inside a metabolic chamber***"² but without the multimillion-dollar price tag, or complexity, so that it is more broadly accessible.

Before addressing the terms of reference. We would like to make a few comments about the nature of T2DM, obesity and metabolism. MHS are not academic experts in T2DM although we are networked to such people worldwide primarily because they are using our product for their research. These comments come from the activity we are aware of from the 'cutting edge' and especially from what we see in clinical practice from ourselves and others.

¹ http://institute.swissre.com/events/Redefining_Diabetes.html

² <https://www.vox.com/2018/9/4/17486110/metabolism-diet-fast-weight-loss>

Leading pharmaceutical company Novo Nordisk cites research³ linking 195 conditions to obesity including T2DM. Tackling obesity and tackling T2DM go hand in hand with each other as well as the other 194 conditions that cost our health budget dearly.

T2DM is a metabolic disease. Metabolism is the set of complex biochemical processes related to the growth and function of the body. Energy metabolism is the subset of processes related to the use of fuel by the body- fuel originally from food.

T2DM is *largely* an outcome of poor energy metabolism and is relatively late in the continuum of a metabolically dysregulated journey that starts with (often but not always) obesity, metabolic syndrome, increasing insulin resistance, fatty liver, pre-diabetes and then T2DM. Fat metabolism is dysregulated and fat accumulates in the body especially centrally in the abdomen and eventually in the vital organs. This process is accompanied by increasing insulin resistance which is when more insulin than normal is required from one's pancreas to bring about the lowering of blood glucose.

Finally, the pancreas cannot keep up with an effective amount of insulin to control blood glucose and T2DM is diagnosed. That is neither really the start nor is it the end. T2DM is regarded as a 'chronic progressive' disease that can only be managed to perhaps prevent or delay complications. The complications include retinopathy (blindness), nephropathy (kidney disease eventually requiring dialysis), neuropathy (nerve dysfunction and death often leading to limb amputation, heart failure and erectile dysfunction in men) and cardiovascular disease.

To be metabolically healthy means that our life processes are in order and functioning as they should be. In particular for energy metabolism, think of the body as being like an LPG gas and petrol car that is running well and using two fuels efficiently but with a very small LPG (carbohydrate) tank and a very large petrol (fat) tank. The body, like a well-tuned car, should run well and easily on either carbohydrate (LPG) or fat (petrol) regardless of whether that fuel came from the meal we just ate or was from the stored surplus from last year or six months ago. We call this **metabolic flexibility**. Being metabolically flexible is a good sign of metabolic health.

The body will always prefer carbohydrate because, like LPG, it is 'cheaper' to run and its tank is smaller so it cannot store much and it must be used first. It will also squirrel away any fat into its big 'tank' (like petrol) even if the fat tank starts to overflow and fat starts to accumulate where it shouldn't until it interferes with normal operation.

Alcohol is a third fuel that causes metabolic problems however we will leave that aside for simplicity's sake.

If our body is not metabolically flexible, it is not able to switch fuels to burn it's own body fat easily. Body fat will accumulate and we will have difficulty keeping weight under control.

³ Michele M. Yuen, MBBS; David T. Lui, MBBS; Lee M. Kaplan, MD PhD; Nitya Kadambi, BA; Rebecca L. Earle, BS; Joseph Brancale, AB; Scott Kahan, MD MPH FTOS "T-P-3166 A Systematic Review and Evaluation of Current Evidence Reveals 195 Obesity-Associated Disorders (OBAD)," Poster at Obesity Week, New Orleans 2016

Add overeating to metabolic inflexibility and you have the core issue behind obesity and T2DM.

Alternatively, when we are metabolically flexible, we easily burn our own body fat and if we add body fat due to a time of abundance, we use that fat again in times when food is less abundant. At least that is how things are supposed to work!

Many people believe that if you have 'lucky genes' you will be unlikely to get T2DM. Genes do appear to play a role but not as great as some think. The current theory of Professor Roy Taylor, Newcastle University, UK, (who has probably studied T2DM remission more than anyone) is that everyone has a personal fat threshold⁴ beyond which T2DM develops. That threshold varies individually and in particular Asians and many indigenous people see T2DM at lower body mass indexes. Within each person's racial 'phenotype' the fat threshold will also vary individually so that (for example) some Caucasians will have T2DM at a low BMI and some Asians may not express T2DM until they have a high BMI. Additionally, as we age our metabolic flexibility can decline making us more prone to metabolic diseases like T2DM.

Credible estimates are that the majority of our population are heading towards T2DM (>60%⁵) and if Prof. Taylor's 'personal fat threshold' theory is correct, it is reasonable to suggest that the increasing rate of T2DM is due to more of these people gaining weight and passing their personal fat threshold as they get progressively older and more obese.

With that explanatory pre-ambule about the problem, we now address the terms of reference of this inquiry and possible solutions.

a. The cost of type 2 diabetes to the community

T2DM has a high cost to the community. A useful resource (although written nearly a decade ago) is "**Diabetes: The Silent Pandemic and Its Impact on Australia**"⁶. Taking all costs into consideration it has been recently estimated that diabetes costs Australia \$20.3B per annum in today's dollars⁷ putting it in the same order as our national defence budget. Using a 10% estimate for WA, the cost for us is roughly \$2B.

MHS sees the cost in the problems of its clients with T2DM but does not see the many complications that place a burden on our hospital system. It has been calculated that there were nearly one million hospitalisations for T2DM in Australia in 2016⁸ meaning (again estimating 10%) about 100,000 for WA.

A recent report estimates for the NHS in the UK are that about 1 in 6 hospital beds are taken for diabetes-related illness and it is likely to head to 1 in 4 by 2030⁹. We should expect a similar burden here.

⁴ <https://www.ncbi.nlm.nih.gov/pubmed/25515001>

⁵ <https://youtu.be/aUNXF48Msc?&t=1246> (Swiss Re, Food for Thought)

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<https://static.diabetesaustralia.com.au/s/fileassets/diabetes-australia/e7282521-472b-4313-b18e-be84c3d5d907.pdf>

⁷ <https://www.adea.com.au/wp-content/uploads/2018/04/Hannah-Carter-presentation.pdf> Slide 11

⁸ <https://www.aihw.gov.au/reports/diabetes/diabetes-compendium/contents/hospital-care-for-diabetes>

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https://www.diabetes.org.uk/resources-s3/2018-10/Making%20Hospitals%20safe%20for%20people%20with%20diabetes_FINAL.pdf

Of course, T2DM personally costs so much more to our community. Its miserable complications ruin lives and take family members from us sooner than we would hope.

b. The adequacy of prevention and intervention programs

If Prof. Taylor's personal fat threshold theory holds true then tackling T2DM would seem simple.

For intervention, we need people with T2DM to lose body fat to drop below their personal fat threshold, and, based upon Prof. Taylor's work, especially remove (ectopic) fat from the liver and pancreas.

Current interventions do not achieve this. While reversing T2DM is more complicated than just losing weight, therein lies the problem. Most healthy people have trouble losing weight and keeping it off. For metabolic reasons, people with metabolic syndrome have even more trouble and that difficulty only increases with pre-diabetes and T2DM.

Faced with a near impossibility to lose weight, T2DM treatment has focussed on management. For reasons of general health and with the hopeful expectation of weight loss, usually, a low-fat, calorie-reduced diet consistent with the Australian Dietary Guidelines (ADG) is the diet recommended. Unfortunately, this rarely delivers a correction to the underlying metabolic dysregulation so the disease remains chronic and progressive and may, given the dominant role of carbohydrate in the ADG, actually worsen the disease progression in some subjects.

Similarly, if the personal fat threshold theory is valid, for prevention we just need to help people at risk of T2DM from gaining body fat and help them lose body fat to further reduce risk.

The ADG should, for a healthy population, offer some protection against T2DM as the evidence used to formulate them specifically included such evidence. It should also act to prevent obesity and to manage weight. Clearly, it is not doing as was intended.

The reason that it is not doing that well is disputed. Many dietitians, including those that put the guidelines together, believe that the problem is adherence to the guidelines which is stated as poor and perhaps as low as 1%. Obviously, if people ignore the guidelines and live on junk food the guidelines cannot be effective.

Others question if the evidence behind the guidelines is robust enough as much of the evidence used is based on epidemiological studies which can be prone to confounding and other issues¹⁰.

A third issue is that if, for whatever reason, we now have 60% or more of the population with metabolic syndrome, pre-diabetes or T2DM, are the current dietary guidelines (which are not for anyone with a medical condition) still relevant for the majority of the population?

Finally, dietary guidelines are largely based on population studies. These are statistical in nature and it may be that statistically, there is too much variation in individual

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<http://www.latimes.com/opinion/op-ed/la-oe-teicholz-wansink-dietary-guidelines-20181009-story.html>

metabolism for them to work well widely. They have also changed little over forty years and we may have drifted away from the 'norm' that they were created for. An individualised approach is clearly always going to be better.

There is emerging research that shows T2DM can be predicted up to twenty years before a traditional diagnosis would be made¹¹. We agree and believe there is a strong scientific case that metabolic dysregulation and particularly abnormal fat oxidation (the ability to 'burn' fat) is an excellent predictor of future T2DM to use as a target for prevention of T2DM and to directly tackle obesity. This view is supported by other groups both in Australia and internationally.

WA is to be commended on the 'Live Lighter' campaign as this focuses on the issue of ectopic fat which is a metabolic health issue and the precursor to T2DM. The next logical step is to move on from there to focus on how we reverse ectopic fat accumulation and by extension, reverse T2DM. The concepts of metabolic health and metabolic flexibility make a great deal of sense in any public health message.

Existing programs and dietary guidelines are clearly not decreasing either obesity or T2DM and current interventions are not achieving remission or reversal. In fact, if anyone is achieving remission or reversal it is likely that they are departing from regular T2DM management.

c. The use of restrictive diets to eliminate the need for type 2 diabetes medication

Restrictive diets are a Medical Nutritional Therapy tool to assist with metabolic dysregulation. In common with bariatric surgery, the correct restrictive diet has a metabolic effect that aids weight loss for people with T2DM. Restrictive diets may involve the restriction of a particular macronutrient, intermittent fasting or severe caloric restriction. Ultimately, all such diets work to cause fat loss by caloric restriction causing weight loss. Most typically for T2DM if a single macronutrient is restricted then for metabolic reasons, it is carbohydrates with an increase in protein and/or fat.

Some restrictive diets (eating patterns) used for T2DM are:

- Low Carbohydrate Healthy (High) Fat
- The Ketogenic Diet (Very Low Carbohydrate Ketogenic Diet)
- Low Carbohydrate High Protein
- Very low-calorie diet- eg. 800 calories per day (Newcastle Protocol)
- Intermittent fasting diet¹² (eg. 5:2 Michael Mosely Low Carb Mediterranean Diet)

Most often these eating patterns can also be combined with intermittent fasting usually 16:8 (two meals a day) or 23:1 (one meal a day). Sometimes periods of extended fasting are used but generally fasting greater than 24 hours is not recommended and above two to three days may actually be adverse for metabolic health.

It is notable that traditional aboriginal diets appear to be 'restrictive' diets as dietitians might classify them; being low in (refined) carbohydrate and high in protein from animal

¹¹ <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5932476/>

¹² <https://edition.cnn.com/2018/10/09/health/diabetes-fasting-study/index.html>

sources- if not all the time then at least seasonally and locationally. Taking a closer look at the dietetic composition of local traditional diets might provide wise solutions more appropriate for some or indeed all West Australians.

Clearly, all of these diets are different and the correct approach must be taken depending upon the patient. If restrictive diets have one feature in common, it is that they cause a calorie deficit to promote weight loss and improve fat oxidation (fat burning) so that body fat is 'burned' increasing metabolic flexibility and improving a person's ability to lose fat. Restrictive diets exercise your metabolism to improve metabolic flexibility, much like stretching exercises your muscles to improve your physical flexibility.

At the Swiss Re conference, we were exposed to many different programs tackling T2DM. These included Dr Jason Fung's (nephrologist from Canada) fasting focussed approach, Dr David Unwin's low carbohydrate approach, Virta Health and Professor Stephen Phinney's ketogenic approach among a number of others.

Effective programs based on restrictive diets are achieving T2DM remission rates between forty and sixty per cent. Even if they are not inducing remission, they are generally still improving health and reducing medications. Without such therapy, remission of T2DM is rare and sporadic if at all, and T2DM is chronic and progressive for most people with T2DM.

d. Regulatory measures to encourage healthy eating

It is clear that refined carbohydrates such as sugar and flour are metabolically dysregulating however they have interwoven into our society's food culture and it is hard to see how regulations, beyond taxing sugar, could assist. Nevertheless, there is perhaps a role for WA government policy.

For example, the WA government is to be commended for enacting policy to remove sugary drinks from hospitals.

Some examples of possible further health policy are:

- WA hospital menus could be reviewed to ensure that patients can access a restrictive diet (if that is how they manage their T2DM and it is medically appropriate for reasons of their stay) while in hospital.
- The 'Live Lighter' campaign was a leading campaign conceived in WA that raised the issue of ectopic (toxic) fat with the general public. This is actually a metabolic health campaign. It has been a great success and adopted by other jurisdictions. It is perhaps now appropriate to extend the public's understanding of metabolic health as the next logical extension of that message. This may do more to address obesity and T2DM than unhelpful messages to "move more and eat less."
- Diabetes is diagnosed quite late and this is unfortunate as we can do better. The state health policy might explicitly recognise metabolic syndrome and insulin resistance as target metabolic conditions prior to diabetes as a measure for prevention.

- The WA government might consider policy promoting equity of access for metabolic health and restrictive diets to rural, remote and aboriginal communities especially given the higher burden of disease in some of those locations.
- The state government could leverage COAG to change legislation, systems or constraints in the federal government.

e. Social and cultural factors affecting healthy eating

It is notable that while Diabetes Australia has a position statement on Low Carbohydrate diets¹³, the Dietitian's Association of Australia (DAA) has a policy which is discouraging of the same diets for T2DM¹⁴ and that it self-accredits all dietitians in Western Australia outside of AHPRA.

Due to their extreme nature compared to the ADG, DAA has regarded many of the restrictive diets as fad diets¹⁵ and does not recommend that people follow them without consulting a dietitian. Technically, dietitians should have the skills and freedom to use restrictive diets as medical nutrition therapy, however, an issue appears to be that as they are being quite newly applied to T2DM, many do not have the experience or evidence to use them confidently. MHS believes metabolic measurement would provide the evidence for dietitians to use restrictive diets appropriately.

MHS does not have one absolute diet prescription for all obese or diabetic people. Instead, MHS has shown that it's technology provides the hard measurement evidence for a diet to be used that is effective within a particular patient's preference.

Adherence to an effective and personalised restrictive diet to reverse T2DM followed by a maintainable diet is the key for longer term T2DM remission. MHS's experience shows that objective measures of metabolism provide the evidence needed for both phases.

That said, MHS has been instrumental in organising Low Carb Down Under events in Perth to bring the latest opinions from experts about low carb-restrictive diets to people in Western Australia¹⁶ as a lower carb diet is one effective restrictive diet for people with T2DM.

f. Behavioural aspects of healthy eating* and effective diabetes self-management

The key to using a restrictive diet for T2DM is that it must reverse (via lifestyle change) the metabolic dysregulation that caused T2DM. It must then be maintained in some measure or replaced with a 'maintenance phase' (different diet) so that the lifestyle habits that caused the metabolic dysregulation do not return and metabolic health is maintained.

¹³

<https://static.diabetesaustralia.com.au/s/fileassets/diabetes-australia/8b4a8a54-f6b0-4ce6-bfc2-159686db7983.pdf>

¹⁴ <https://daa.asn.au/voice-of-daa/hot-topics/#> (December 2017)

¹⁵ <https://daa.asn.au/voice-of-daa/hot-topics/#> (August 2017)

¹⁶ <https://lowcarbdownunder.com.au/events/low-carb-nutrition-perth-2018/>

MHS's experience shows that a key success factor is to be able to demonstrate to a patient that the restrictive diet they are adopting leads to a measurable change in their metabolism, without hunger or fatigue, which are common limitations to many dietary approaches. The same is true for other lifestyle interventions which could include exercise, medications and supplements, sleep, and dedicated relaxation time. This is gratifying not only to the patient, improving their likely adherence but also to the practitioner who is given evidence that the restrictive dietary intervention or other lifestyle change is justified.

Finding a restrictive diet that can then become a sustainable diet (along with other appropriate lifestyle change) that maintains metabolic health for the patient is also key.

Beyond diet, we should not forget that exercise, sleep, and sometimes medication and supplements are all part of achieving metabolic health for people especially for reversing, best managing or avoiding T2DM.

MHS has begun a small program with a select group of metropolitan GPs targeting patients who are candidates for bariatric surgery. These are the very obese often with T2DM or likely to develop it. The aim is to integrate metabolic testing and lifestyle modification into GP practice to deliver long-term weight loss and metabolic health with metabolic testing being made as accessible as a diabetes blood test. GPs are on the frontline but frequently do not have access to the tools (metabolic testing) and are not given the time to effect lifestyle management. If GPs are unsuccessful at managing or reversing T2DM, then the burden falls on the hospital system to try and remediate complications.

We must not lose sight of the fact that T2DM is the result of lifestyle. Without lifestyle change, it will remain a problem that medication will only band-aid. Unfortunately today, medication is the easiest option for both doctors and patients.

MHS was very pleased to see this inquiry originating here in WA. It is a very forward-looking inquiry addressing health issues that are a great burden on the community. We were indeed feeling that we had our business located away from the action in this area and have been looking to Europe for our main collaborations but the committee's forward thinking to call this inquiry into this important area has motivated us to provide this detailed submission at home.

Despite the basic science of metabolism being hundreds of years old, our understanding of the interplay of metabolic health, obesity and T2DM is emerging right at the time that restrictive diets are being used by more people to tackle obesity, T2DM and T2DM risk.

We would like to finish with the following considerations for the committee.

As there are about 120,000 people with T2DM in WA and restrictive diets are achieving a remission rate of up to 60%, there is the possibility is to spare 72,000 West Australians from the misery of T2DM. If this might sound unlikely, there is already good evidence from overseas programs suggesting that outcome is achievable.

When we consider that there are about a third of us overweight and a third of us obese and that roughly matches the more than 60% of us that have a metabolic condition. We believe

that the time is now to promote metabolic health and the smart use of restrictive diets for T2DM intervention and prevention.

No government anywhere in the world has turned around the obesity trend in the last forty years. We look forward to being able to work further in Western Australia to make this the first jurisdiction in the world to turn around T2DM and obesity by considering our state's metabolic health.

Yours faithfully,

John Wright
CEO, Metabolic Health Solutions Pty Ltd