

Review of the Evidence Surrounding Different Eating Patterns for Weight loss and Co-Morbidities

Note: The key to maintaining a healthy weight in the long-term is an eating pattern that is sustainable over time. Dietary recommendations should always be tailored to an individual, as what works for one person, may not work for another. That is, there is no one-size-fits-all approach when it comes to achieving and maintaining a healthy weight.

Diet	Ketogenic/high protein/high fat	Paleo	Vegetarian /vegan	Intermittent fasting (IF)	Very Low Energy Diet (VLED)	DASH	Mediterranean
Key elements	Very low carbohydrate (CHO), moderate in protein and high in fat. CHO intake is less than 10% of energy per day or 20-50g of CHO ¹ .	Refers to eating how our "hunter-gatherer" ancestors used to eat. It includes a diet based on protein (meat, fish, chicken, and eggs), fruit, vegetables, nuts/seeds ⁷ .	A vegetarian diet excludes meat/meat products but usually includes dairy foods and eggs. A vegan diet excludes all animal products e.g. no meat, fish, dairy, cheese, yoghurt and honey ¹¹	Restricting food/drink intake to 0-25% of energy needs (~500kcal or 2092 kilojoules for women and ~600kcal or 2510 kilojoules for men) 2-3 days per week (fasting days), which is followed by 'normal' healthy eating on non-fasting days ^{16,17} .	Nutritionally complete dietary preparations of shakes, bars, soups or desserts, such as Optifast/Optislim (800kcal or 3347 kilojoule per day). Diet should include water, low starch vegetables (>2cups/d), and can add 1tsp oil. In other phases fruit, dairy and a protein serve/s are included. ²⁰	The DASH diet does not manipulate macronutrient groups or require any 'special' foods to be purchased, but promotes fresh fruit, vegetables, wholegrains, low fat dairy, fish, poultry, legumes, nuts and good quality vegetable oils ²⁴ .	Consists of a primary plant based diet including lots of vegetables, fruit, legumes, wholegrains, beans, nuts, seeds, herbs and spices and olive oil. The diet also promotes moderate fish, lean protein and eggs, however red meat should only be consumed less than once per week. Also, one small glass of wine can be consumed once per day with a meal ²⁶ .
Main exclusions	The ketogenic diet is different from other low CHO or low energy diets due to the diet remaining proportionately lower in CHO which keeps the body in a state of ketosis, even if total energy increases ¹ .	Excludes a large selection of CHO foods including breads, cereals, grains, legumes, milk, yoghurt and processed foods, as well as cheese and some oils ⁷ .	As above.	On fasting days must limit foods containing large amounts of carbohydrate, protein and fat to help reduce energy intake ¹⁶ .	All food and alcohol; except for meal replacement products and low starch vegetables (>2cups/d). If following other phases extra oil, fruit, dairy and protein serve/s pending VLED phase ²⁰ .	Salt and high salt foods. Limit foods high in saturated/trans fats, fatty meats, full-fat dairy, tropical oils such as palm oil and coconut oil, high sugar foods, sugar sweetened drinks ²⁴ .	Limited to less than weekly: sugary drinks and foods, snack foods, sweet and savoury pastries, processed meats, refined grains, unhealthy fats, deep fried foods and takeaways ²⁶ .
Weight loss	Short-term weight loss will occur due to reduction in total energy (kJ) intake, depletion of liver and muscle glycogen stores and associated water loss which reduces appetite ² . Long term weight loss is unlikely due to the highly restrictive diet being unsustainable over time ² . Only transient weight loss is observed; where most people put more weight on after undertaking the keto-diet ³ .	No high quality long term studies regarding the effect of a paleo-diet and subsequent weight loss ⁸ . Some studies suggest 3-7% total body weight loss with the key finding that weight loss was due to a spontaneous 20-30% decrease in calorie/overall energy/kilojoule intake after consuming less processed or takeaway foods ^{8,9,10} .	Vegetarian diets and vegan diets in particular, appear to have beneficial effects on weight reduction and a lower BMI. However, these benefits are often attenuated over time ¹² . Longer-term intervention trials are needed to investigate the effect of vegetarian diets on weight control and cardiometabolic risk ¹² .	Short-term intervention studies show intermittent fasting can reduce body weight and fat mass between 3-12kg ¹⁸ . Currently there is no evidence regarding the efficacy and effectiveness of IF diets for long term weight loss. Research suggests high dropout rates even in short-term studies ^{16,17} ; so long term maintenance must be considered.	Average of 1.0-2.5kg loss per week in intensive phase but highly variable between individuals and tapers off as the weeks go by ²¹ . By the end of the program 9.2-19.3kg, and 7.2-12.9kg after 1-2 yrs ²¹ .	The DASH diet in addition to exercise could assist with up to 6-8kg long term weight loss for those who are overweight/obese ²⁵ . The weight loss mechanism is believed to be from total energy reduction after limiting the above listed exclusions which are usually energy dense and nutrient poor ²⁵ . The diet is also nutritionally complete and can assist with satiety to help with long-term weight maintenance.	A large scale meta-analysis ²⁷ reported significantly reduced weight by a mean of 1.75kg in the short term (1-4 weeks). Larger reductions in body weight were observed when diets further restricted energy (3.8kg) and increased exercise (4.01kg). Further weight loss is observed when participants received regular follow up and support from a clinician ²⁷ .

Benefits	Potentially decreased HbA1c due to weight loss and lack of CHO ⁴ . Some research suggests improved lipids because of weight loss ⁴ while others did not, due to the increased size and volume of LDL cholesterol particles ⁵ . May improve fat oxidative metabolism, although mechanisms are not well understood ⁴ .	Short term benefits could include weight loss (as above), reduced plasma lipid levels and blood pressure, satiety, increased insulin sensitivity and lower fasting glucose. The benefits are mainly from weight loss, after reducing total energy and not the diet itself ⁷ .	Modest weight loss, increasing fruit and vegetable intake and associated longevity, decreasing saturated fat intake, improved insulin sensitivity, lower rates of some cancers, decreased BP, increased heart health, lower environmental footprint ¹²⁻¹⁵ .	Short term studies indicate weight loss, reduced fasting glucose and insulin levels, improved insulin sensitivity and lipid profiles ^{17,19} . There are limited high quality long term studies with control groups and researchers believe the mechanism behind the benefits is due to overall energy/kilojoule restriction which can be achieved by numerous other dietary methods, most of which can be maintained long term.	Excelled weight loss, suppression of ghrelin, assist in appetite control, ketosis/protein intake may suppress muscle mass loss, improvements in BGLs, lipids, BP and other health benefits associated with weight loss ²¹	Research reveals the DASH diet assists in weight loss, lowers BP, lowers LDL cholesterol and increases HDL cholesterol; therefore provides a reduction in heart disease risk ^{24,25} .	Weight loss ²⁷ , improvements in glycaemic control including a reduced HbA1c, improved insulin sensitivity, reduced fasting plasma glucose and post prandial glucose, therefore potentially reducing diabetes medications ²⁸ . Improvements in cardiovascular risk factors (reduced BP, reduced LDL cholesterol and increased HDL cholesterol) preventing heart disease and stroke ²⁸ . Improvements in non-alcoholic liver disease, overall mortality, brain function, gut-microbiome and reduces risk of dementia and some cancers ²⁹ .
Risks	Unable to meet food group recommendations ¹ Low fibre intake and excessive protein intake (usually including processed and red meat) increases risk of bowel cancer. High fat intake increases the risk of higher lipid profiles ¹ . High risk of hypoglycaemia for patients on insulin. Increased nitrogen secretion can lead to possible renal damage ³ .	Hypoglycaemia, changes to digestive health/increased risk of bowel cancer because of high meat intake ⁷ , deficiency in calcium and decline in bone health ⁷ , associated with higher sodium intake, higher saturated fat intake as diet promotes coconut oil and butter (increases cholesterol) ⁷ .	Iron deficiency, B12 deficiency, menstrual disruption, calcium deficiency, protein deficiency and Omega 3 deficiency ¹¹ (if diet is not supplemented). Vegans need to consider the supplementation of particular nutrients such as B12, iron, omega 3s and zinc ¹²⁻¹⁵ .	Short term studies have noted risks such as over-eating on non-fasting days and an impact on mental status ¹⁷ . Because of the restrictive nature IF is not suitable for people at risk of or with history of eating disorders. On fasting days, medication may need to be changed, such as insulin or OHA due to risk of hypoglycaemia. Risk of nutritional deficiencies in extreme fasting cases if a healthy diet is not followed on other days.	Hypoglycaemia, low BP, electrolyte disturbances, gut issues, headaches, pancreatitis, gall stones, gout, and menstrual cycle changes. Long list of cautions and contraindications, including excessive loss of muscle mass, advanced kidney disease ²³ . See clinical treatment protocol for more details.	Nil associated risks recorded or hypothesized. The diet promotes a healthy balanced diet with a decrease in undesirable food choices. Overall it aligns with the Australian Guide to Healthy Eating.	Nil associated risks recorded or hypothesized. Similar to the DASH diet, the Mediterranean diet promotes a healthy balanced primarily plant based diet with less red meat, refined carbohydrates and undesirable food choices.
Long term evidence & adherence	Studies involving ketogenic diets for weight loss or epilepsy treatment have extremely high dropout rates due to poor tolerance of the diet due to its restrictive nature ^{1,6} . There is a lack of long-term data regarding weight loss, diabetes control and improvement of other co-morbidities.	Nil long term evidence. 2 year studies have high dropout rates and poor-compliance because the diet is difficult to adapt to and more expensive ⁷ . While the diet promotes fruit, vegetables and healthier protein choices, it fails to provide all the nutrients and excludes whole food groups ⁷ .	Long term evidence suggests that vegetarian/vegan diets can be somewhat protective and decrease overall mortality due to increased fruit and vegetable intake and better lipid profiles.	Nil long term evidence. Short term studies have ongoing issues with adherence to fasting days because of their extremely restrictive nature ¹⁶⁻¹⁹ .	Large body of evidence looking at Optifast and VLEDs over many decades which demonstrates its effectiveness in weight reduction and maintenance throughout the four Optifast phases ^{21,22} .	Evidence suggests that the DASH diet has good long term adherence and changes to dietary habits, weight and blood pressure persist after initial education/counselling regarding how to follow the DASH diet ²⁵ .	Because the diet is high in poly and monounsaturated fats as well as other food sources listed above, it is considered to help with satiety and can be followed on a long-term basis ²⁷⁻²⁹ . However, we must ensure that the diet can be easily adapted to incorporate a Western-style diet and lifestyle.

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