



Type 2 Diabetes

Type 2 diabetes occurs when the body is unable to use sugar (glucose) properly.

Normally, when blood sugar levels rise the pancreas is stimulated to produce insulin. Insulin allows muscles and other parts of the body to absorb glucose and use it as energy. Insulin also stops the liver from producing extra glucose when it's not needed. When the extra glucose has been used up, the pancreas stops producing insulin and the insulin-producing cells of the pancreas can rest.

In type 2 diabetes, the blood sugar levels are often high for too long, putting the pancreas under pressure to produce more insulin. Over time the body stops responding properly to insulin, meaning that it can no longer use glucose properly. This results in decreased energy, and other symptoms including thirst and urinary frequency.

The unused glucose also causes damage to blood vessels resulting in a number of complications. When the large blood vessels are damaged this can lead to a stroke or heart attack. When the small vessels are damaged this can lead to sight loss, kidney damage and potentially amputation of the arms or legs.

The management of type 2 diabetes focusses on lowering blood sugar levels.

Hba1c is a blood test which shows the blood sugar levels over the preceding three months. It is used to monitor diabetic control.

Until recently, management has focussed on managing the disease and reducing complications. Recently it has become clear that with the right management, type 2 diabetes can be cured. For most people this requires significant lifestyle changes, including good nutrition and exercise, ideally with support both from professionals and from family/ friends.

There is growing evidence that whole food plant-based nutrition can help to cure type 2 diabetes as part of a sustainable lifestyle intervention. Unlike other strict low calorie diabetic diets, this does not require calorie counting or restriction and is generally sustainable in the long-term.

Key points from research:

- Type 2 diabetes can be prevented through lifestyle intervention
- Type 2 diabetes can be cured by lifestyle intervention
- A plant-based diet can help to prevent or reverse type 2 diabetes

Can type 2 diabetes be prevented through lifestyle intervention?

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| Title | Diet, Lifestyle, and the Risk of Type 2 Diabetes Mellitus in Women |
| Link | https://www.nejm.org/doi/10.1056/NEJMoa010492?url_ver=Z39.88-2003&rfr_id=ori:rid:crossref.org&rfr_dat=cr_pub%20%200www.ncbi.nlm.nih.gov |
| Question | Is type 2 diabetes a lifestyle disease? |
| Summary | This study looked at the association between lifestyle factors and the development of diabetes over a 16-year period. It found that increased weight, poor diet, smoking and lack of exercise were associated with an increased risk of |

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| | type 2 diabetes. Participants with a healthy lifestyle were 91% less likely to develop diabetes than those with a less healthy lifestyle. |
| Context | Lifestyle is known to contribute to the development of type 2 diabetes. This study investigated how lifestyle factors can influence the risk of diabetes over time. |
| Methods | 84, 941 female nurses participated in this study. None had diabetes at the start of the study. They were followed up for 16 years and information about their lifestyles was updated periodically. A low-risk group was defined as those who exercised for 30 min/ day, had a BMI <25, ate a diet low in fat and sugar and high in fibre and did not smoke. |
| Results | 3,300 participants developed type 2 diabetes over the 16-year period. Increased weight, lack of exercise, poor diet and smoking were all associated with increased risk of type 2 diabetes. Those who fell into the low-risk group regarding their lifestyle were 91% less likely to develop type 2 diabetes than the rest of the group. |
| Conclusion | This study showed that type 2 diabetes is strongly associated with lifestyle factors. Maintaining a healthy lifestyle reduced the risk of type 2 diabetes by 91% in this study. |

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| Title | Long-term Effects of Lifestyle Intervention or Metformin on Diabetes Development and Microvascular Complications: the DPP Outcomes Study |
| Link | https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4623946/ |
| Question | Can lifestyle intervention prevent diabetes in prediabetics? |
| Summary | This study looked at patients with prediabetes. It found that an intensive lifestyle intervention reduced the risk of developing diabetes by 27% in this high risk group. |
| Background | <p>Prediabetes refers to a stage just before the development of diabetes, where a person's blood sugars are not severely enough affected to meet the criteria for type 2 diabetes. People with prediabetes are at high risk of developing type 2 diabetes.</p> <p>Metformin is a diabetic medication that is often given to prediabetic patients to try to prevent the development of diabetes. However it is not clear if an intensive lifestyle intervention would be equally effective.</p> |
| Methods | This study followed 2,776 patients for a total of 15 years. Patients were divided into three groups; group 1 received medical treatment with Metformin, group 2 underwent an intensive lifestyle intervention and group 3 received a placebo. Patients were monitored for progression to type 2 diabetes. |
| Results | Compared to the placebo group, the incidence of type 2 diabetes was reduced by 18% in the Metformin group and 27% in the lifestyle intervention group. |
| Conclusion | This study showed that an intensive lifestyle intervention is more effective than Metformin for preventing the development of type 2 diabetes in prediabetic patients. |

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| Title | Reduction in the Incidence of Type 2 Diabetes with Lifestyle Intervention or Metformin |
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| Link | https://www.nejm.org/doi/full/10.1056/NEJMoa012512 |
| Question | Can lifestyle interventions prevent diabetes? |
| Summary | This study looked at a group of patients at risk of diabetes. It compared the effectiveness of metformin medication or a lifestyle intervention compared to a placebo. It found that over 3 years a lifestyle intervention reduced the incidence of diabetes by 58%, while metformin reduced the incidence by 31%. |
| Background | Before an individual is diagnosed with diabetes, there is a period during which the person's blood sugars are elevated but not yet meeting the criteria for diabetes. This is a crucial time for intervention because the right management can prevent diabetes from developing. This study investigated whether a medical treatment or a lifestyle intervention is more effective for preventing diabetes. |
| Methods | 3,234 people participated in this study. All had raised blood sugar levels but did not yet meet the criteria for diabetes. Participants were divided into three groups. Group 1 received medical treatment with metformin 850 mg bd. Group 2 received a lifestyle intervention involving a healthy, low fat diet and 150 minutes of exercise per week; patients received individual weekly support for the first 6 months and monthly thereafter. Group 3 (the control group) received a placebo. |
| Results | Patients were followed for an average of 2.8 years. The incidence of diabetes was reduced in the lifestyle intervention group by 58% and in the metformin group by 31% compared to placebo. |
| Conclusion | This study showed that both lifestyle intervention and metformin reduce the risk of diabetes significantly in at risk patients. The lifestyle intervention was noticeably more effective than metformin. |

Can type 2 diabetes be cured through lifestyle intervention?

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| Title | Population response to information on reversibility of Type 2 diabetes |
| Link | https://onlinelibrary.wiley.com/doi/10.1111/dme.12116 |
| Question | Can weight loss cure type 2 diabetes? |
| Summary | This study looked at a group of 77 self-motivated type 2 diabetics who sought out information on managing their diet, and reported their results back to the providers. Patients engaged in a low calorie diet. Patients lost an average of 14.8 kg in weight, hba1c fell by an average of 31 mmol/mol and reversal of diabetes occurred in 61% of patients. |
| Background | It is well known that weight loss helps to reduce the risk of and the complications of type 2 diabetes. However it is less clear if weight loss can reverse established type 2 diabetes. Reversal of diabetes is said to have occurred when a patient has a hba1c level of <43 mmol/mol when they are not taking any diabetic medications. |
| Methods | This study followed a previous study which had reported on reversal of type 2 diabetes in patients on a low calorie diet. People with type 2 diabetes who heard of this research sought out information on the authors' website and engaged with this diet. 77 patients who followed this process then reported back to the authors on their experience. Patients who participated had had type 2 diabetes for an average of 5.5 years. |

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| Results | Participants lost an average of 14.8 kg in weight. Their hba1c level reduced by an average of 31 mmol/mol. The reduction in hba1c correlated with weight loss, with the greatest reductions seen in the group that experience the most weight loss. 61% of patients achieved reversal of diabetes. |
| Conclusion | This study showed that health-motivated patients can achieve reversal of diabetes through nutritional intervention at home. |

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| Title | High rates of diabetes reversal in newly diagnosed Asian Indian young adults with type 2 diabetes mellitus with intensive lifestyle therapy |
| Link | https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5320825/ |
| Question | Can diet and exercise cure type 2 diabetes? |
| Summary | This study looked at the effect of an intensive lifestyle intervention in young type 2 diabetics. It found that intensive intervention led to complete remission from type 2 diabetes in 46.9% of patients at 2 years. |
| Context | Lifestyle changes are always advised for the management of type 2 diabetes but there is more evidence recently that intensive lifestyle change can reverse type 2 diabetes completely. |
| Methods | This study followed a group of 32 newly diagnosed young Asian type 2 diabetics. Patients were treated with an intensive lifestyle intervention, as well as standard medical treatment where appropriate. The lifestyle intervention involved calorie restriction of 1500 kcal/day and brisk walking for 1 hour per day. Medications were stopped when hba1c levels fell below 48 mmol/mol. Complete remission was defined as a hba1c <39 mmol/mol and a fasting blood glucose of <5.6 mmol/L off medication. Patients were followed up for at least 2 years. |
| Results | After 2 years, 46.9% of patients were in complete remission from type 2 diabetes without any medication. |
| Conclusion | This study showed that an intensive lifestyle intervention can reverse type 2 diabetes in up to half of patients at 2 years. |

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| Title | Fasting-mimicking diet promotes Ngn3-driven β -cell regeneration to reverse diabetes |
| Link | https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5357144/ |
| Question | Can periodic fasting reverse type 2 diabetes? |
| Summary | This study looked at intermittent fasting in mice with medically-induced type 2 diabetes. It found that mice who underwent intermittent fasting showed increased production of β -cells in the pancreas, normalised blood sugar levels and improved survival. |
| Context | <p>Insulin is produced by the β-cells in the pancreas in both mice and humans. Insulin enables our bodies to use the sugar that we consume. In type 2 diabetes the body becomes resistant to insulin and the pancreas is put under pressure to produce extra insulin. Eventually the β-cells in the pancreas wear out and die.</p> <p>There is some evidence that fasting reduces insulin resistance but it is not clear if it also affects the insulin-producing β-cells in the pancreas.</p> |

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| Methods | This study looked at mice who had been genetically modified to suffer from type 2 diabetes. Mice with this modification generally only survived for 4 months. In this study mice were started on an intermittent fasting regime at 3 months old, when they were in the advanced stages of type 2 diabetes. Blood sugar levels and effects on the pancreas were monitored. |
| Results | With intermittent fasting blood sugars normalised in mice with advanced type 2 diabetes. Pancreas β -cells increased in number due to genetic changes. |
| Conclusion | This study suggests that intermittent fasting has the potential to improve insulin production by the pancreas. More studies are needed to see if these findings are applicable to humans. |

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| Title | Association of an Intensive Lifestyle Intervention With Remission of Type 2 Diabetes |
| Link | https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4771522/ |
| Question | Can a lifestyle intervention cure type 2 diabetes? |
| Summary | This study compared the effectiveness of an intensive lifestyle intervention for type 2 diabetes with standard treatment. It found that patients who underwent an intensive lifestyle intervention were 7 times more likely to remain in remission after 4 years than patients on standard treatment. |
| Background | Lifestyle changes are known to be important in the management of type 2 diabetes and recently it has become clear that with the right intervention some patients can go into remission from diabetes. Patients are said to be in remission when their blood sugar control has improved to a point that they no longer meet the criteria for diabetes (hba1c <48 mmol/mol). |
| Methods | This study followed 4,503 type 2 diabetics over a period of 4 years. Patients were divided into two groups. Group 1 received standard treatment and advice. Group 2 received an intensive lifestyle intervention involving weekly counselling for 12 months, followed by fortnightly counselling for 3 years. Hba1c levels were used to measure blood sugar control and to monitor for remission. |
| Results | At 12 months, 9.2% of patients in the intensive intervention group were in sustained remission from diabetes, compared to <2% of the standard treatment group. After 4 years, 3.5% of the intensive intervention group remained in sustained remission, compared to 0.5% of the standard treatment group. |
| Conclusion | This study showed that patients who undergo an intensive lifestyle intervention are more likely to achieve remission from type 2 diabetes, and to sustain this remission over a period of 4 years. |

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| Title | Piloting a Remission Strategy in Type 2 Diabetes: Results of a Randomized Controlled Trial |
| Link | https://academic.oup.com/jcem/article/102/5/1596/3070517?login=true |
| Question | Can a lifestyle intervention cause type 2 diabetes to go into remission? |
| Summary | This study looked at the effects of an 8 or 16 week intensive lifestyle intervention, compared to standard diabetic treatment in type 2 diabetics. It found that compared to patients on standard treatment, patients who |

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| | underwent an 8 week or 16 week lifestyle intervention were 2 or 2.85 times more likely to go into remission respectively. |
| Background | It has recently been found that with the right intervention type 2 diabetes can go into remission. This means that the person's blood sugars no longer meet the criteria for diabetes and they are not considered to be diabetic. This can be achieved in some patients with medical treatment, but it may be possible to achieve this with lifestyle intervention. |
| Methods | 83 type 2 diabetic patients participated in this study. Patients were divided into three groups. Group 1 underwent an 8-week lifestyle intervention, group 2 underwent a 16-week lifestyle intervention and group 3 continued on standard diabetic treatment. The lifestyle intervention included individualised diet and exercise plans with weekly follow-up for the first 8 weeks and fortnightly follow-up for the remaining 8 weeks. The lifestyle intervention groups also received medical treatment as needed. |
| Results | 12 weeks after completing the intervention, 21.4% of the 8-week intervention group and 40.7% of the 16-week intervention group were in remission from type 2 diabetes, compared to 12.5% of the standard treatment group. |
| Conclusion | This study showed that a combination of intensive lifestyle intervention and medical treatment is more effective than medical treatment alone at inducing remission from type 2 diabetes. |

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| Title | Diabetes Remission after Nonsurgical Intensive Lifestyle Intervention in Obese Patients with Type 2 Diabetes |
| Link | https://www.hindawi.com/journals/jdr/2015/468704/ |
| Question | Can weight loss cure type 2 diabetes? |
| Summary | This study looked at the effect of weight loss on patients with prediabetes and obesity. It found that after a 12-week intensive weight loss programme 21.6% of patients had a significant improvement in diabetic control and 4.5% went into remission from type 2 diabetes. Those patients who went into remission had a >7% loss of total body weight. |
| Background | Weight loss is usually part of the management for type 2 diabetes, but it is not clear if weight loss can help to reverse type 2 diabetes. |
| Methods | 88 patients with type 2 diabetes and obesity completed a 12-week weight loss programme and were followed up for 12 months. Their weight was monitored and hba1c levels were used to monitor their diabetic control. |
| Results | After 12 months, 4 patients were in remission from type 2 diabetes. These patients had achieved an average weight loss of >7% of body weight. 21.6% of patients showed a significant improvement in their diabetic control. |
| Conclusion | This study showed that an intensive weight loss intervention can enable diabetic patients to go into remission from diabetes. |

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| Title | Durability of a primary care-led weight-management intervention for remission of type 2 diabetes: 2-year results of the DiRECT open-label, cluster-randomised trial |
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| Link | https://www.thelancet.com/journals/landia/article/PIIS2213-8587(19)30068-3/fulltext subscription required |
| Question | Can a GP-led lifestyle intervention cure diabetes ? |
| Summary | This study looked at the effect of a GP-led lifestyle intervention on patients with type 2 diabetes. It found that patients who underwent a lifestyle intervention were 12 times more likely to be free from diabetes after 2 years than those receiving standard care. |
| Background | It is known that lifestyle changes are important in the management of type 2 diabetes. However it is not clear where lifestyle interventions can be delivered effectively and how well their effects endure over time. |
| Methods | 306 patients with type 2 diabetes were involved in this study. Patients were divided into two groups; group 1 received a lifestyle intervention and group 2 received standard care. The intervention group followed a strict low calorie diet and were followed up regularly by their primary healthcare team. Patients were monitored for weight changes, changes in blood sugar control (hba1c) and for remission from diabetes. |
| Results | It found that after 2 years, 36% of patients who underwent a lifestyle-intervention were free from diabetes, compared to 3% of patients who had standard care. The intervention group also lost on average 5.4 kg more in weight than the standard care group. The intervention group also had an average reduction in hba1c of 29% more than the standard care group, despite only 40% of this group using medications compared to 84% of the standard care group. |
| Conclusion | This study showed that after 2 years of lifestyle intervention, one third of type 2 diabetics achieved sustained remission from their condition. |

Which diet is best for preventing, managing and curing type 2 diabetes?

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| Title | Vegetarian diets and incidence of diabetes in the Adventist Health Study-2 |
| Link | https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3638849/ |
| Question | Which diet is best for preventing type 2 diabetes? |
| Summary | This study compared the risk of type 2 diabetes in people consuming one of 5 different types of diet, ranging from vegan (no plant products) to non-vegetarian (eat everything). It found that compared to non-vegetarians, vegans were 62% less likely to develop type 2 diabetes over a 2-year period. |
| Background | Diabetes is often described as a lifestyle disease because it is widely accepted that the Western diet and lifestyle is associated with a high risk of developing type 2 diabetes. It has been suggested that a plant-based diet is beneficial for preventing type 2 diabetes. This study investigated the risk of diabetes in vegans and vegetarians, compared to non-vegetarians. |
| Methods | This study involved 41,387 participants from the USA and Canada all of whom were free from diabetes. Participants provided information regarding their diets and lifestyles. They were divided into 5 groups according to their diet; vegans (no animal products), lacto-ovo vegetarians (dairy and eggs, no meat), pescovegetarians (diary, eggs and fish), semi-vegetarians (dairy, eggs, meat <1 per week), and non-vegetarians (meat >1 per week). They were followed up after 2 years to establish how many participants in each group had developed type 2 diabetes. |

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| Results | 0.54% of vegans developed type 2 diabetes, compared to 1.08% of lacto-ovo vegetarians, 1.29% of pesco-vegetarians, 0.92% of semi-vegetarians and 2.12% of non-vegetarians. The incidence of type 2 diabetes was lowest in the vegan diet group and highest in the non-vegetarian group. |
| Conclusion | This study showed that compared to a diet that includes regular meat, a vegan diet is associated with a 62% lower risk of type 2 diabetes over a 2-year period. |

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| Title | Processed meat intake and incidence of Type 2 diabetes in younger and middle-aged women |
| Link | https://link.springer.com/article/10.1007%2Fs00125-003-1220-7 |
| Question | Does processed meat increase the risk of developing type 2 diabetes? |
| Summary | This study looked at the effect of processed meat consumption on the risk of type 2 diabetes in young women. |
| Context | Processed meat is known to increase cholesterol and cause potential damage to cells in the body. It is less clear how much it contributes to the development of type 2 diabetes. |
| Methods | 91,246 American women aged 26-46 participated in this study. Participants were followed up for 8 years to see how many developed type 2 diabetes. Information on their diets was collected, specifically how much processed meat they consumed. |
| Results | 741 patients developed type 2 diabetes over the 8 year period. Those women who consumed processed meat >5 times per week were 91% more likely to develop diabetes than women who consumed less processed meat. |
| Conclusion | This study showed that women who consume processed meat frequently are almost twice as likely to develop type 2 diabetes as those who do not. |

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| Title | Does a vegetarian diet reduce the occurrence of diabetes? |
| Link | https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1646264/pdf/amjph00281-0061.pdf |
| Question | Does a vegetarian diet reduce the occurrence of diabetes? |
| Summary | This study looked at the risk of type 2 diabetes in a largely vegetarian religious community compared to the general population of the USA. It found that there was a reduced risk of death from type 2 diabetes in the vegetarian group compared to the general population. |
| Context | 25,698 White Seventh Day Adventists participated in this study which began in 1960. Member of this religious group were encouraged to avoid meat by their leaders. Approximately 50% of members followed a vegetarian diet. This study investigated whether this diet reduced the risk of type 2 diabetes compared to a standard Western diet. |
| Methods | 25,698 White Seventh Day Adventists participated in this study. Participants were followed up for 21 years to determine how many deaths were caused by type 2 diabetes. |
| Results | Members of this group were 50% less likely to die of diabetes than the general population of the USA. Vegetarian members of this group were also less likely to die from diabetes than non-vegetarian members. |

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| Conclusion | This study showed that a more plant-based diet may reduce the risk of type 2 diabetes. |
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| Title | Dietary intake of total, animal, and vegetable protein and risk of type 2 diabetes in the European Prospective Investigation into Cancer and Nutrition (EPIC)-NL study |
| Link | https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2797984/ |
| Question | Does high protein consumption increase the risk of type 2 diabetes? |
| Summary | This study looked at the effect of protein consumption on the risk of developing type 2 diabetes. It found that increased consumption of animal protein more than doubled the risk of developing type 2 diabetes amongst participants. |
| Context | Diets aimed at preventing type 2 diabetes usually focus on sugars and fat. It is less clear if certain types of protein can affect the risk of developing diabetes. |
| Methods | 38,094 people participated in this study. Participants provided information regarding the protein content of their diets. Participants were followed up for 10 years to monitor for the development of type 2 diabetes. |
| Results | 918 participants developed type 2 diabetes over the 10 year period. People who consumed high amounts of animal protein were more than twice as likely to develop type 2 diabetes as those who consumed less protein but a similar overall amount of food. Vegetable protein was not associated with an increased risk of type 2 diabetes. |
| Conclusion | This study showed that regardless of overall food consumption, increased animal protein consumption doubles the risk of developing type 2 diabetes. |

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| Title | Plant versus animal based diets and insulin resistance, prediabetes and type 2 diabetes: the Rotterdam Study |
| Link | https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6133017/ |
| Question | Can a relatively plant-based diet protect against type 2 diabetes? |
| Summary | This study looked at 6,798 patients in the Netherlands. It found that participants who ate a more plant-based diet were 11% less likely to develop prediabetes and 18% less likely to develop type 2 diabetes than those who ate less plant-based diets. |
| Background | There is evidence that a vegan or vegetarian diet can help to prevent the development of type 2 diabetes. This study investigated whether moving to a more plant-based diet (but not necessarily vegan or vegetarian) can also reduce this risk. |
| Methods | 6,798 participants from the Netherlands were involved in this study. Participants provided detailed information regarding their diets. Researchers then rated each individual's diet on a scale from least to most plant-based ranging from 0 to 92. Participants were followed up for an average of 6.5 years to monitor for the development of type 2 diabetes or prediabetes. |
| Results | Participants who ate a more plant-based diet were less likely to develop prediabetes or type 2 diabetes. For every 10 point increase of the plant-based diet scale there was an 11% reduction in the risk of prediabetes and an 18% reduction in the risk of type 2 diabetes. |
| Conclusion | This study showed that eating a more plant-based diet is beneficial for the prevention of type 2 diabetes. |

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| Title | Fresh fruit consumption in relation to incident diabetes and diabetic vascular complications: A 7-y prospective study of 0.5 million Chinese adults |
| Link | https://journals.plos.org/plosmedicine/article?id=10.1371/journal.pmed.1002279 |
| Question | Can eating fruit prevent diabetes? |
| Summary | This study looked at a population of 0.5 million adults in China. It compared the risk of diabetes and the severity of diabetes in patients who consumed fruit on a daily basis and those who did not. It found that patients who ate fruit daily were 12% less likely to develop diabetes than those who did not eat fruit. Of patients who had diabetes, those who ate fruit daily had a 17% lower risk of death than those who did not, and also had a 13-28% lower risk of diabetic complications. |
| Background | Fruit and vegetables are usually recommended for diabetic patients as part of a healthy lifestyle, but concerns are sometimes raised about the sugar content of fruit. This study investigated whether fruit is beneficial for diabetic patients and in the prevention of diabetes. |
| Methods | 0.5 million Chinese adults participated in this study. 30,300 participants had diabetes diagnosed before the study and 9,504 patients were diagnosed with diabetes during the study. Participants were asked about the amount of fruit on their diets. Participants were followed up for 7 years to monitor for the development of diabetes, and for the development of any complications in the diabetic patient group. |
| Results | Participants who ate fresh fruit daily were 12% less likely to develop type 2 diabetes than those who did not. For those patients who had diabetes fresh fruit consumption was associated with a 17% lower risk of death and a 13-28% lower risk of diabetic complications. |
| Conclusion | This study showed that consuming fresh fruit on a daily basis helps to prevent diabetes and helps to reduce complications in diabetic patients. |

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| Title | A low-fat vegan diet improves glycemic control and cardiovascular risk factors in a randomized clinical trial in individuals with type 2 diabetes |
| Link | https://care.diabetesjournals.org/content/29/8/1777.long |
| Question | Which diet is best for lowering blood sugar? |
| Summary | This study compared the effects of two diets in type 2 diabetics; a vegan diet and the diet recommended by the American Diabetic Association (ADA). It found that both diets resulted in lower blood sugars and lower cholesterol, but the results were greatest with the vegan diet. 43% of the vegan group were able to reduce their diabetes medications, compared to 26% of the ADA group. LDL cholesterol was reduced by 21.2% in the vegan group and 10.7% in the ADA group. |
| Context | It has been shown that diet is important in the management of type 2 diabetes. The American Diabetes Association (ADA) recommend a diet that is spread across all food groups, with an emphasis on fruit and vegetables but some meat/dairy is allowed and fat consumption is not strictly controlled. However with recent evidence that diabetes can be reversed with the right lifestyle changes, it |

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| | is important to discover if a different diet could have more of an impact. This study looked at the effect of a low-fat vegan diet (no animal products, fat <10% of calories) compared to the standard ADA diet. |
| Methods | 99 patients with type 2 diabetes participated in this study. They were divided into 2 groups and encouraged to follow a specific diet for 22 weeks. Group 1 followed the ADA diet while group 2 followed a vegan diet. Hba1c and cholesterol were measured at the start and after 22 weeks. |
| Results | 43% of patients in the vegan group were able to reduce their medications due to improved blood sugar control during the 22 weeks, compared to 26% of the ADA diet group. The average hba1c in the vegan group reduced by 10.5 mmol/mol in the vegan group and 6.5 mmol/mol in the ADA group. Weight decreased by 6.5 kg in the vegan group and 3.1 kg in the ADA group. LDL cholesterol fell by 22.2% in the vegan group and 10.7% in the ADA group. |
| Conclusion | This study showed that both low-fat vegan and ADA diets lead to improved diabetic control, reduced cholesterol and weight loss over a 22 week period. These effects are greater with a low-fat vegan diet than with the ADA diet. |

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| Title | Vegetarian diets and glycemic control in diabetes: a systematic review and meta-analysis |
| Link | https://cdt.amegroups.com/article/view/4977/5858 |
| Question | Can a vegetarian diet improve diabetic control? |
| Summary | This study looked at the effect of a vegetarian diet on blood sugar control in type 2 diabetics. It found that a vegetarian diet reduced hba1c by an average of 4 mmol/mol compared to a non-vegetarian diet. |
| Background | Some studies have shown that a vegetarian diet improves blood sugar control in type 2 diabetics. This study systematically reviewed previous studies on this topic to determine if this is the case. |
| Methods | The results of 6 clinical trials involving vegetarian diets in type 2 diabetics were reviewed. A total of 255 patients were assigned to follow a vegetarian diet for an average of 23.7 weeks. In the case of 6 studies this was a vegan diet, and for on estudy it was a lacto-ovo vegetarian diet (dairy and eggs, no meat). Hba1c levels were used to measure blood sugar control during the study. |
| Results | A vegetarian diet was associated with a reduction in hba1c of 4%. |
| Conclusion | This study showed that a vegetarian diet helps to improve blood sugar control in type 2 diabetics. |

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| Title | Effectiveness of plant-based diets in promoting well-being in the management of type 2 diabetes: a systematic review |
| Link | Effectiveness of plant-based diets in promoting well-being in the management of type 2 diabetes: a systematic review - PubMed (nih.gov) Subscription required |
| Question | Can a plant-based diet improve well-being? |
| Summary | This study looked at the effect of a plant-based nutritional intervention on type 2 diabetic patients, relating to general health and well-being. It found that plant-based diets were associated with improved emotional well-being and quality of life, and reduced weight, cholesterol, hba1c and depression. |
| Background | Plant-based lifestyle interventions have been shown to be good for preventing and |

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| Methods | This study reviewed 11 previous studies involving a total of 433 patients. Patients were divided into two groups; group 1 started on a plant-based diet intervention, group 2 continued standard treatment (control group). Patients were followed up for an average of 23.2 weeks. |
| Results | Patient in the plant-based intervention group showed reduced levels of depression, improved quality of life and increased self-esteem compared to the control group. Patients in the intervention group also noticed a decrease in diabetic nerve pain. Hba1c reduced by an average of 4 mmol/mol more in the intervention group than in the control group. The intervention group also lost 2.4 kg more weight on average than the control group and their cholesterol decreased by 0.57 mmol/L compared to 0.29 mmol/L |
| Conclusion | This study showed that a plant-based diet can improve diabetic control, cholesterol and mental well-being in type 2 diabetics patients. |

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| Title | Reversal of type 2 diabetes: normalisation of beta cell function in association with decreased pancreas and liver triacylglycerol |
| Link | https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3168743/ |
| Question | Can a plant-based diet alone control type 2 diabetes? |
| Summary | Nutrition is always considered an important part of the management of type 2 diabetes but it is not clear how it compares to medication and how exactly it improves blood sugar control. |
| Background | Type 2 diabetes is caused by a loss of insulin sensitivity. This means that the insulin produced by the body no longer affects the body in the same way. In individuals without diabetes, the liver senses an increase in insulin from the pancreas and stops producing glucose (sugar). When this function no longer works the liver continues to produce glucose unchecked, leading to high blood sugar levels. |
| Methods | 11 patients with type 2 diabetes participated in this study. Patients were instructed to stop their diabetic medications before the start of the study. They were then started on a low calorie plant-based diet for 8 weeks. Meals were provided and participants were supported with weekly phone consultations. A number of complicated tests were used to measure the response of the liver to insulin, before, during and after the intervention. |
| Results | After 1 week, blood sugar levels normalised from 9.2 mmol/L to 5.9 mmol/L. The ability of the liver to respond to insulin increased from 43% to 74%. After 8 weeks, the ability of the liver to respond to insulin was greater than in non-diabetic individuals. |
| Conclusion | The study showed that a closely monitored plant-based diet has the potential to reverse type 2 diabetes over an 8-week period. |

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| Title | Lifestyle Weight-Loss Intervention Outcomes in Overweight and Obese Adults with Type 2 Diabetes: A Systematic Review and Meta-Analysis of Randomized Clinical Trials |
| Link | https://www.jandonline.org/article/S2212-2672(15)00259-2/fulltext subscription required |
| Question | Is weight loss an effective treatment for type 2 diabetes? |