

FASTING

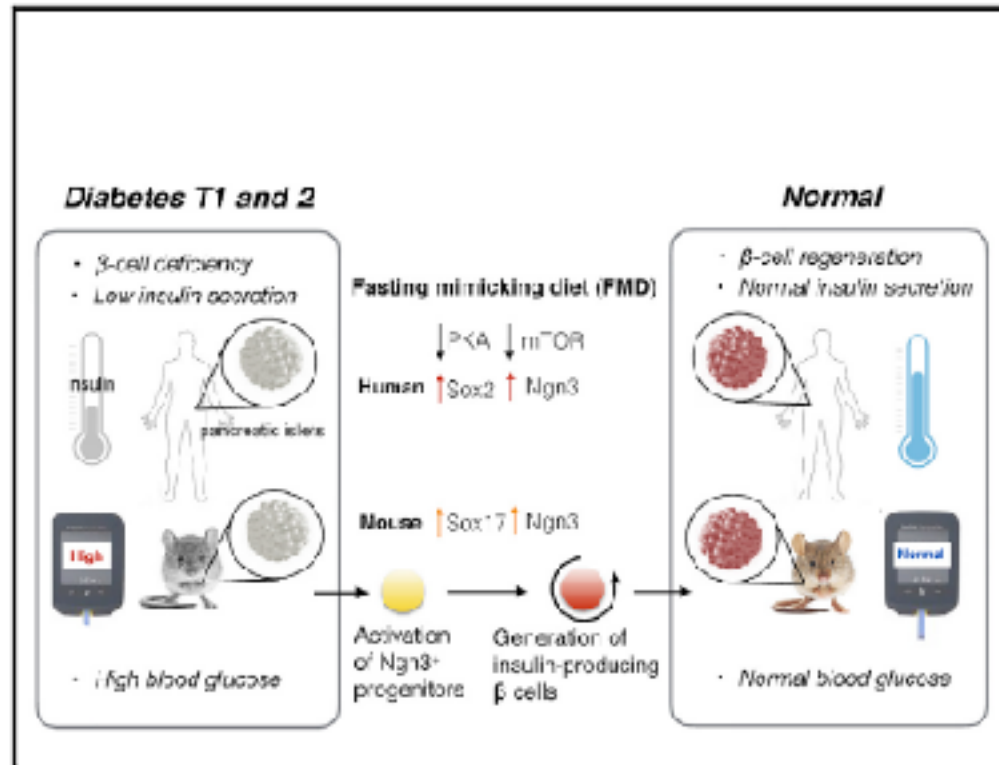


Imagine...

- ▶ A diet that could induce β -cell neogenesis.
- ▶ A way of eating that could restore β -cell function in the pancreas without stem cells or medications and the risks they pose...
- ▶ You do not have to imagine! it has now been done in diabetic mice—twice.

Fasting-Mimicking Diet Promotes Ngn3-Driven β -Cell Regeneration to Reverse Diabetes

Graphical Abstract



Authors

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In Brief

A periodic short-term diet that mimics fasting modulates β -cell regeneration and promotes insulin secretion and glucose homeostasis with potential to treat both type 1 and type 2 diabetes.

Cheng, *et al. Cell*. 2017;168:775-788.

- In mice a 4-day fasting-mimicking diet (FMD) induces a stepwise expression of Sox17 and Pdx-1, followed by Ngn3-driven generation of insulin-producing β cells resembling that observed during pancreatic development.
- FMD cycles restore insulin secretion and glucose homeostasis in both type 2 and type 1 diabetes mouse models.

Cheng *et al.* Fasting-Mimicking Diet Promotes Ngn3-Driven β -Cell Regeneration to Reverse Diabetes. *Cell*. 2017; **168**: 775-788.

These results indicate that a FMD promotes the reprogramming of pancreatic cells to restore insulin generation in islets from T1D patients and reverse both T1D and T2D phenotypes in mouse models.

Cheng *et al.* Fasting-Mimicking Diet Promotes Ngn3-Driven β -Cell Regeneration to Reverse Diabetes. *Cell*. 2017; **168**: 775-788.

Fasting-mimicking Diet

- Plant-based diet designed to attain fasting-like effects on the serum levels of IGF-1, IGFBP-1, glucose, and ketone bodies
- Providing both macro- and micronutrients to minimize the burden of fasting and adverse effects
 - Day 1 of FMD supplies (1,100 kcal, 11% protein, 46% fat, 43% carbohydrate)
 - Days 2 to 5 provide ~3000 kJ per day (715 kcal 9% protein, 44% fat, and 47% carbohydrate)

RESEARCH

Open Access



Intermittent administration of a fasting-mimicking diet intervenes in diabetes progression, restores β cells and reconstructs gut microbiota in mice

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Abstract

Fasting and especially intermittent fasting have been shown to be an effective intervention in many diseases, such as obesity and diabetes. The fasting-mimicking diet (FMD) has recently been found to ameliorate metabolic disorders. To investigate the effect of a new type of low-protein low-carbohydrate FMD on diabetes, we tested an FMD in *db/db* mice, a genetic model of type 2 diabetes. The diet was administered every other week for a total of 8 weeks. The intermittent FMD normalized blood glucose levels in *db/db* mice, with significant improvements in insulin sensitivity and β cell function. The FMD also reduced hepatic steatosis in the mice. Deterioration of pancreatic islets and the loss of β cells in the diabetic mice were prevented by the FMD. The expression of β cell progenitor marker Ngn3 was increased by the FMD. In addition, the FMD led to the reconstruction of gut microbiota. Intermittent application of the FMD increased the genera of *Parabacteroides* and *Blautia* while reducing *Prevotellaceae*, *Alistipes* and *Ruminococcaceae*. The changes in these bacteria were also correlated with the fasting blood glucose levels of the mice. Furthermore, intermittent FMD was able to reduce fasting blood glucose level and increase β cells in STZ-induced type 1 diabetic mouse model. In conclusion, our study provides evidence that the intermittent application of an FMD is able to effectively intervene in the progression of diabetes in mice.

Keywords: Diabetes, Intermittent fasting, Fasting-mimicking diet, Beta cells, Fatty liver, Gut microbiota

Our study has provided further evidence indicating that IF is able to preserve or restore β -cell function, as suggested by a recent study from Dr. Longo's group, in which it was found that Ngn3-driven β -cell regeneration occurred after FMD application in diabetic mice.

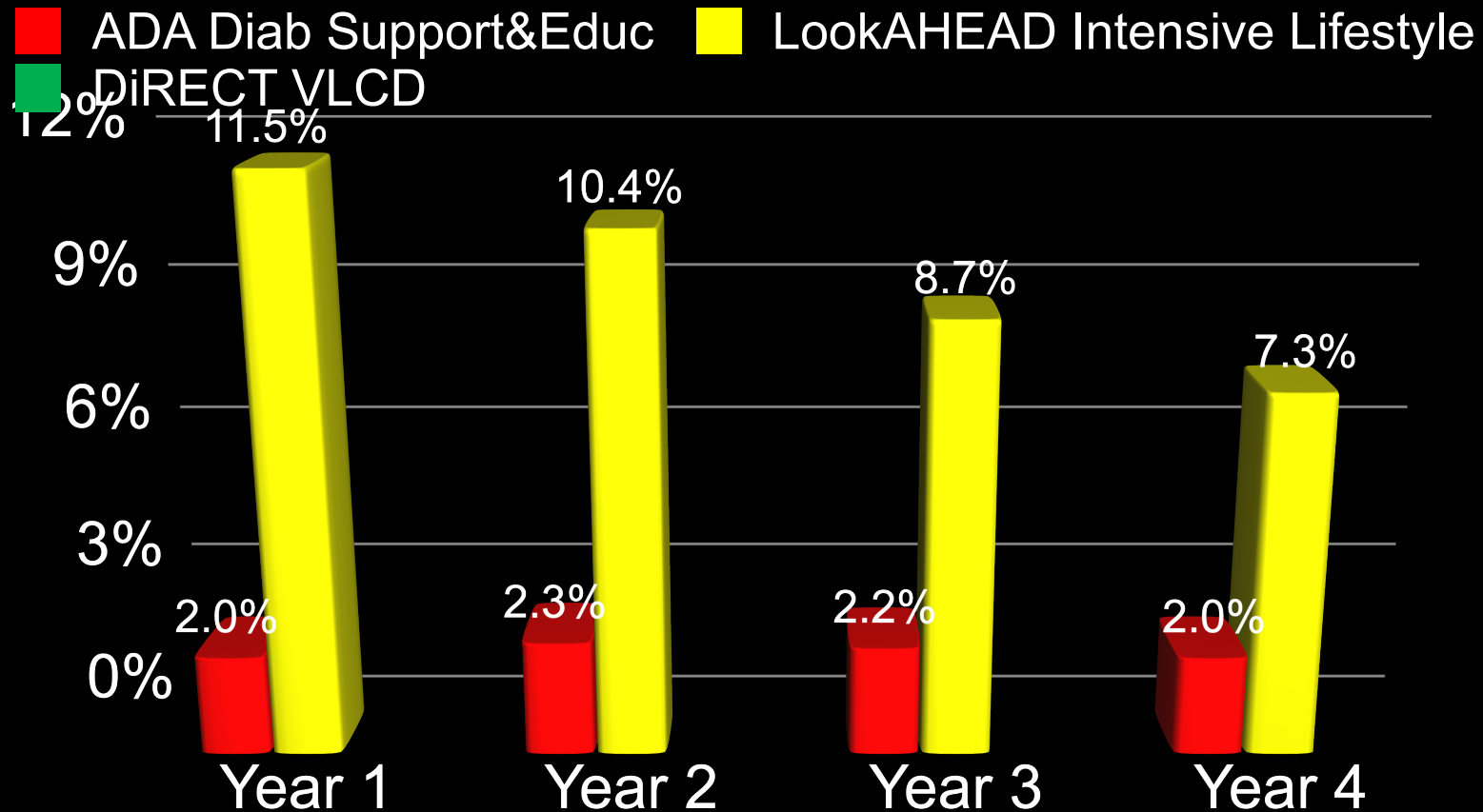
As continuous fasting has not been reported to aid in the regeneration of β -cells in *db/db* mice, we propose that the pattern of intermittent fasting is key to restoring β -cell function.

Wei S, *et al.* Intermittent administration of a fasting-mimicking diet intervenes in diabetes progression, restores β cells and reconstructs gut microbiota in mice. *Nutrition & Metabolism*. 2018;**15**:80.

LookAHEAD Diabetes Trial

- Comparing **intensive lifestyle intervention with diabetes support & education** controls in **4,503** US adults with BMI (body mass index) 25 or higher and T2DM.

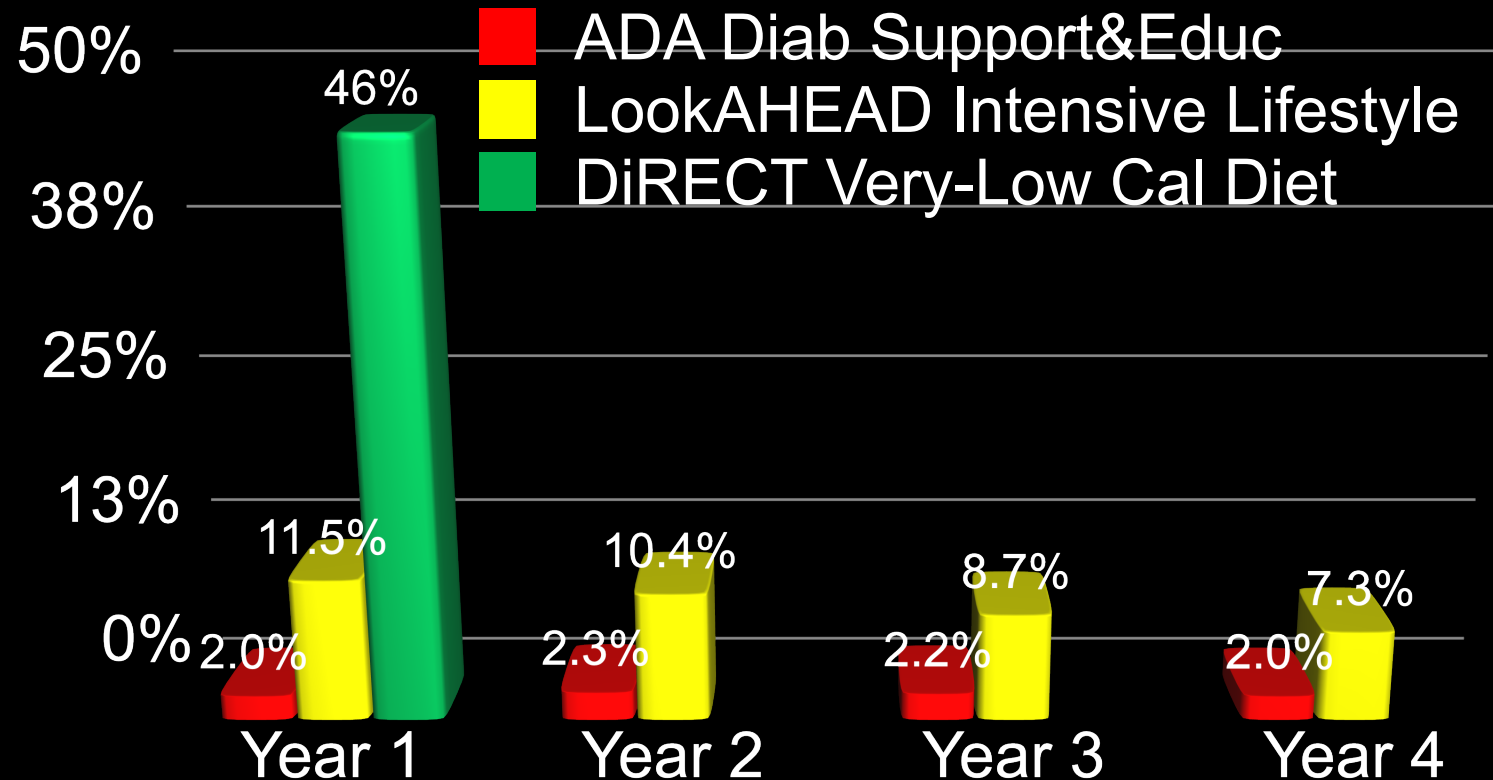
Prevalence of Any Remission (%)



DiRECT Diabetes Trial

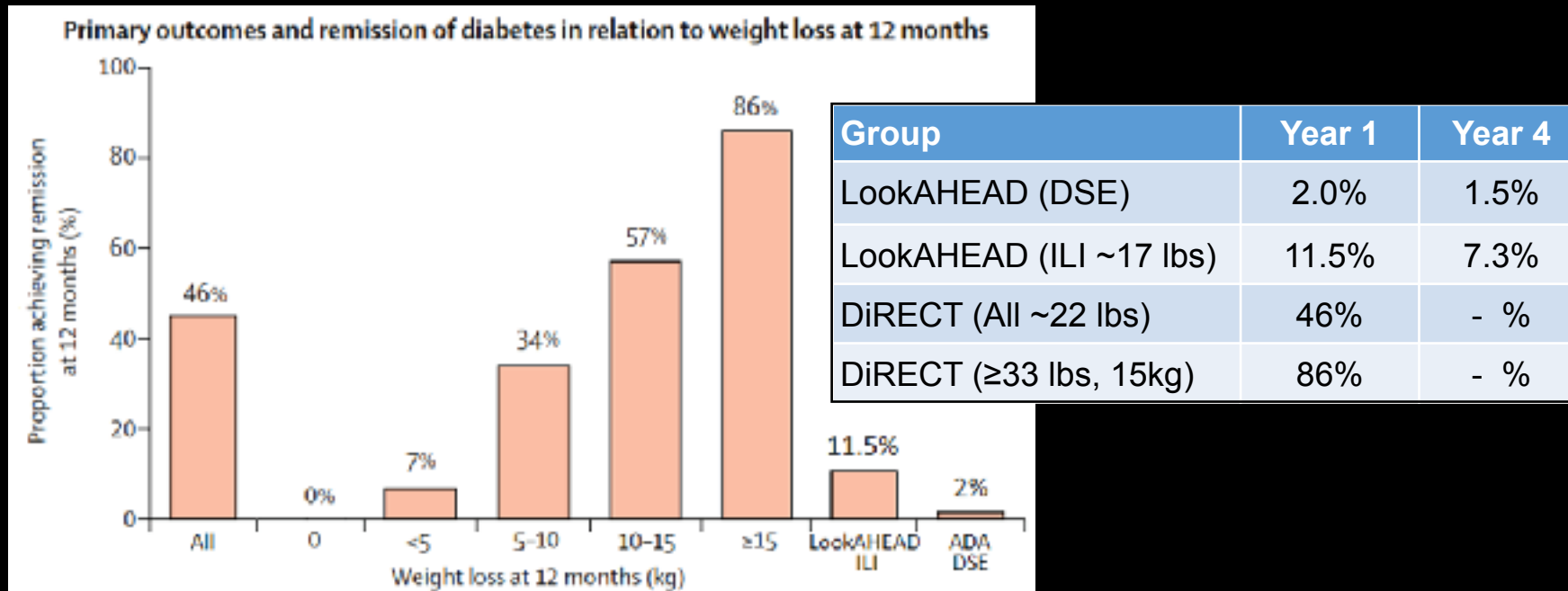
- GOALS: Assess whether intensive weight management within routine primary care would achieve remission of type 2 diabetes
- INTERVENTION: Withdrawal of antidiabetic and antihypertensive drugs, total diet replacement (825-853 kcal/day formula diet for 3-5 months), stepped food reintroduction (2-8 weeks), and structured support for long-term weight loss maintenance. 5,700 Participants

Prevalence of Any Remission (%)



Lean MEJ, et al. Primary care-led weight management for remission of type 2 diabetes (DiRECT): an open-label, cluster-randomised trial. *Lancet* 2018 Feb 10;391(10120):541-551.
Gregg EW, et al. Association of an Intensive Lifestyle Intervention With Remission of Type 2 Diabetes. *JAMA* 2012 Dec 19;308(23):2489-96.


Evidence of Remission and Reversal: Dramatic Changes Required



Lean MEJ, et al. Primary care-led weight management for remission of type 2 diabetes (DiRECT): an open-label, cluster-randomised trial. *Lancet* 2018 Feb 10;391(10120):541-551.

Gregg EW, et al. Association of an Intensive Lifestyle Intervention With Remission of Type 2 Diabetes. *JAMA* 2012 Dec 19;308(23):2489-96.


• **FASTING = REST**



These studies have shown us how fasting is key to reversing diabetes. But we also know that fasting helps us prevent many diseases. Better not wait until you are sick to fast. Much better if we start practicing some kind of fasting to prevent diseases.



➔ **different kinds of fasting**

- 
- ▶ There are some who would be benefited more by abstinence from food for a day or two every week than by any amount of treatment or medical advice. To fast one day a week would be of incalculable benefit to them. { 7T 134.2}
 - ▶ Intemperate eating is often the cause of sickness, and what nature most needs is to be relieved of the undue burden that has been placed upon her. In many cases of sickness, the very best remedy is for the patient to fast for a meal or two, that the overworked organs of digestion may have an **opportunity to rest**. A fruit diet for a few days has often brought great relief to brain workers. Many times a short period of entire abstinence from food, followed by simple, moderate eating, has led to recovery through nature's own recuperative effort. An abstemious diet for a month or two would convince many sufferers that the path of self-denial is the path to health. { MH 235.2}



➔ **R: REFINED**

➔ **A: ANIMAL**

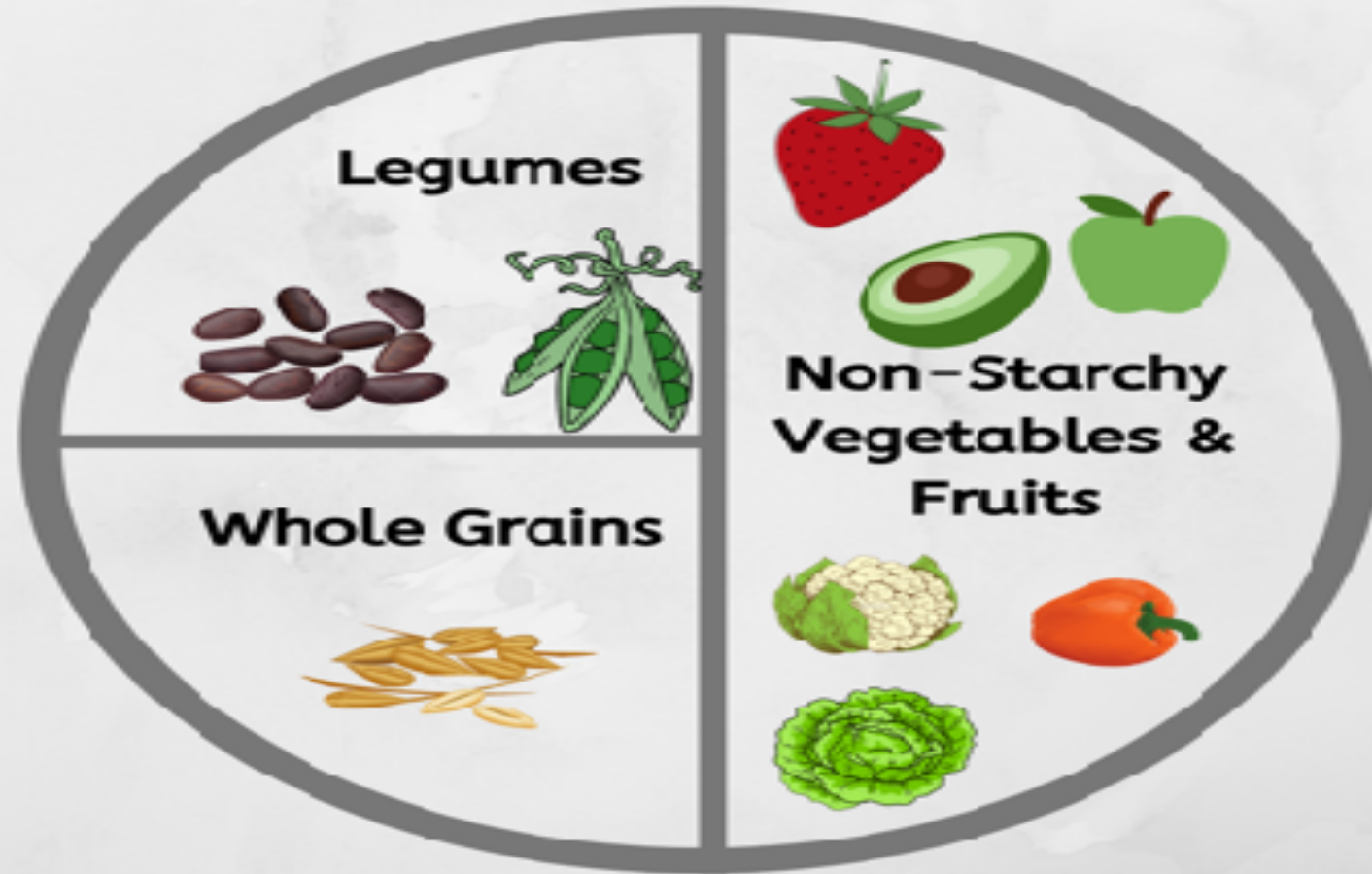
➔ **P: PROCESSED**







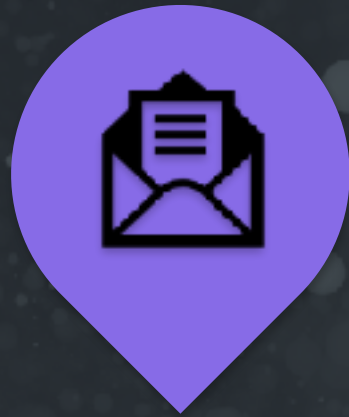
Plate Method



+B12
+ Vitamin D
+Water

+ Nuts & Seeds
+ Calcium Sources

Planificación de fiesta



➔ INVITAR A INVITADOS

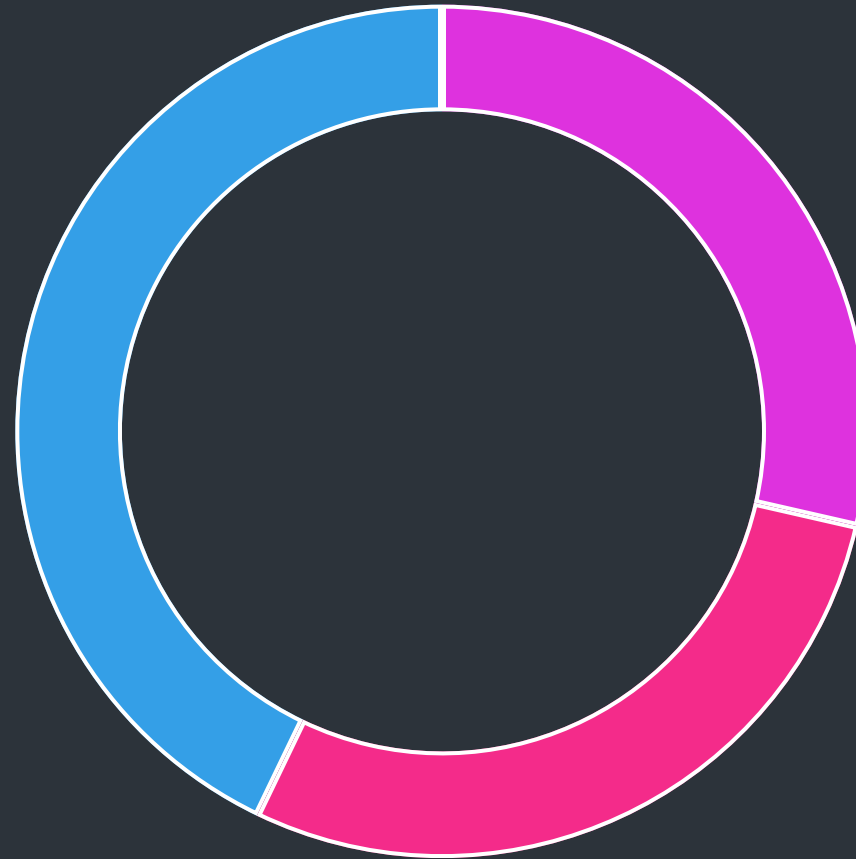


➔ DECORAR



➔ FIESTA

Mejor fecha para la fiesta



● Viernes ● Sábado ● Domingo

Comité de fiesta

➤ Comida

➤ Regalos

➤ Decoraciones





Gracias

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