

HOW AND WHY F&V PREVENT TYPE 2 DIABETES?

- ▶ Globally, diabetes is the seventh leading cause of death. The number of adults aged between 20 and 79 years old with type 2 diabetes (T2D) has almost tripled during the last two decades with more than 620 million adults estimated to have diabetes by 2045, and 90% of cases are likely to be T2D¹.
- ▶ In Europe, 58 million people are living with diabetes and the number is estimated to increase by 16% in 2045^{1,2}.
- ▶ In France, 5% of the population suffer from diabetes (2016): T2D accounts for 90% of cases³.
- ▶ The documented prevalence of T2D in children and adolescents ranges from <2/10000 cases per non-Hispanic White population to ~12/10000 cases per American Indian population⁴. However, the incidence of youth-onset T2D (diagnosis of T2D in those ≤25 years of age) is increasing annually by 7.1% in some countries⁵.
- ▶ Diabetes exposes the patient to severe complications by multiplying by:
 - 8 the risk of amputation
 - 8 the risk of myocardial infarction or stroke
 - 9 the risk of dialysis for end-stage renal failure.

Diabetes is also the 1st cause of blindness in adults and can have a dramatic impact on the quality of life and especially in cases of severe neuropathy⁶ but is also known to present with multiple comorbidities in juveniles⁷.

Diabetes in the world

- > 58 million people in Europe
- > 1 over 10 persons in France
- > 620 million people globally by 2045

Risk factors of T2D

Numerous factors influence the development of type 2 diabetes (Figure 1). The most influential are lifestyle behaviors such as unhealthy diet, low physical activity, overweight, obesity, and smoking.

Up to 80% of type 2 diabetes could be prevented through healthy diet and regular physical activity.

Diabetes is reduced by 58% in people following lifestyle interventions⁸ that recommend the following goals to achieve (Figure 2). Their beneficial effects overcome the impact of family history of diabetes or genetic score and also result in a significant reduction in early diabetic retinopathy¹⁰.

FIGURE 1: RISK FACTORS OF T2D⁸

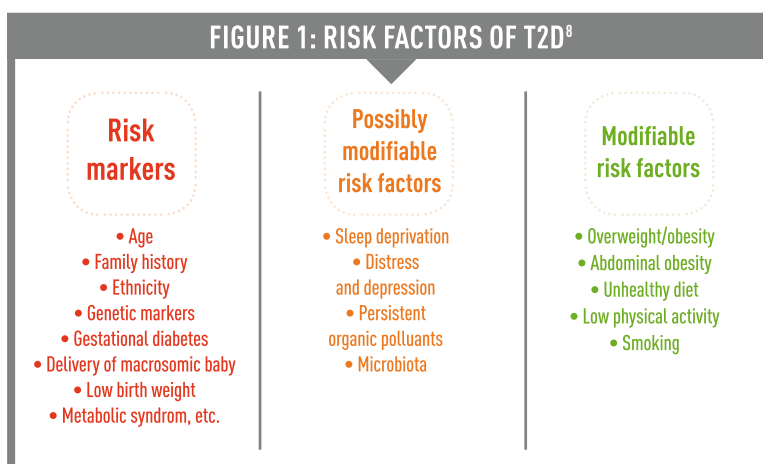


FIGURE 2: GOALS TO ACHIEVE IN LIFESTYLE INTERVENTION^{9,11}

- **Energy restriction** to induce ≥ 5% weight loss
- **Moderate fat intake** 30-40% of total energy
- **Low saturate fat intake:** <10% of total energy
- **Physical activity:** ≥30 min/day
- **High fiber intake** from fruits, vegetables, and wholegrains: 25-30 g/day



F&V and T2D prevention

A sufficient intake of F&V is recommended as part of a healthy diet to reduce the risk of T2D. A higher intake of F&V is associated with a 5 to 13% risk reduction of T2D. Also, an increased consumption of green leafy vegetables, cruciferous vegetables, blueberries and yellow vegetables reduce risk of T2D (Table 1).

As well, each 100 g increase in fruit consumption per day is associated with:

- **13% lower** risk of developing diabetes related complications affecting large blood vessels (e.g. ischemic heart disease and stroke).
- **28% lower** risk of developing complications affecting small blood vessels (i.e. kidney diseases, eye diseases, and neuropathy)¹³.

▶ Table 1: F&V intake and risk reduction of T2D¹²

Increased consumption of	Risk reduction of T2D by
F&V	5 to 13%
Green leafy vegetables	13%
Cruciferous vegetables	18%
Blueberries	25%
Yellow vegetables	28%

How F&V lower T2D risk?

Many constituents and functional aspects of F&V are responsible for the protective effects against T2D.

- Their high content in **dietary fiber** help them improve the ability to delay the absorption of carbohydrates after a meal and thereby decrease the insulinemic response to dietary carbohydrates. This will result in lower postprandial blood glucose and insulin levels. Dietary fiber also increase satiety and reduce the intake of energy-dense foods, resulting in a reduced risk of overweight and obesity, which is an established risk factor of T2D.
- F&V have an important functional aspect which is their **low glycemic index (GI)** and glycemic load (Figure 3). This also makes them associated with prolonged satiety response and may further help in weight control¹⁴.
- Due to their high content in **polyphenols**, including flavonoids and **anti-oxidant compounds** (carotenoids, vitamin C and E), F&V decrease the risk of T2D by mitigating the oxidative stress that interferes with the glucose uptake by cells. Berries are particularly rich in anthocyanins phenolic compounds that have beneficial effect on glucose metabolism and body weight regulation¹².
- F&V are also rich in **magnesium** which plays an important role in insulin action and hypomagnesaemia that is well recognized in persons with T2D. Hypomagnesaemia may impair insulin secretion and promote insulin resistance in the diabetic patient¹⁵.

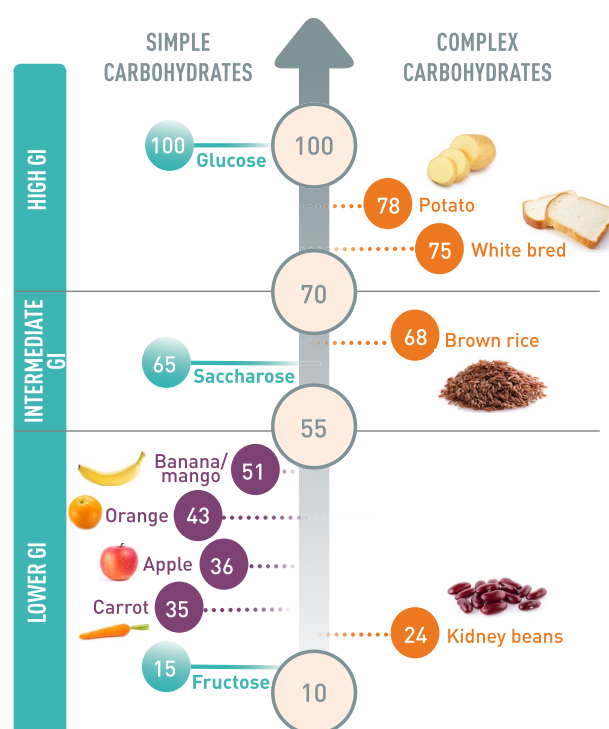
FIGURE 3: GLYCAEMIC INDEX DEFINITION

The GI is a ranking measure of foods based on their acute blood glucose response (GR). It could be influenced by many food aspects:

- nature of the monosaccharide components;
- nature of starch;
- cooking/food processing;
- other food components such as fat and proteins, dietary fiber, organic acids, and antinutrients (e.g. enzyme inhibitors, tannins, lectins and phytates).

The more the carbohydrate in food is digested, absorbed and metabolized slowly, the lower their GI is. Generally, there are 3 categories of foods based on their GI values:

- **High-GI foods (>70):** e.g. white bread, shortgrain white rice, cornflakes, pretzels, etc.
- **Intermediate-GI foods (between 55 and 70):** e.g. whole wheat, rye and pita bread
- **Low-GI foods (<55):** e.g. most fruit, all non-starchy vegetables, legumes and milk^{16,17}.



For further information:
→ sheet 12 "F&V: energy, nutrients and claims"

