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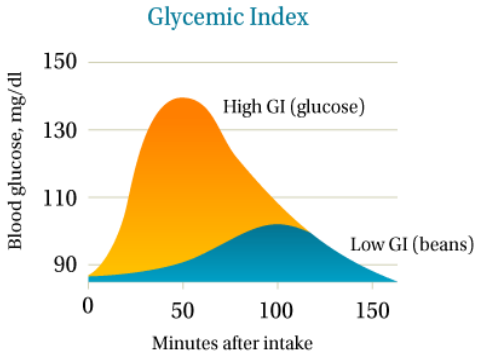
Our Lab Book

IN VITRO MEASUREMENT OF GLYCEMIC INDEX

The glycemic index (GI) expresses the glycemic answer's value of a tested food part containing 50 g of carbohydrate in relation to a quantity of reference food (the white bread and the glucose) containing also 50 g of carbohydrate.

The GI allows the classification of food doses containing equivalent quantities of available glucides according to their potential for risein the blood glucose rate .
Numerous observations showed that GI becomes useful in the field of the public health when it is appropriately used.
This parameter gives an estimation of the sugar nature contained in the food, meaning that food contains mainly sugars with either fast or slow assimilation (RAG : rapidly available glucose or SAG : slowly available glucose). However, if it reflects the glycemic curve that the food will enhance, the IG does not indicate the proportion of sugar contained in the food. **It is a qualitative measure and not a quantitative measure.**



METHOD :
The usual method (*in vivo*) of GI determination consists in following the glycemic answer after the intake of the tested food, by blood sampling and measurement of the glucose rate. This method is long and expensive.
An alternative method exists : **the *in vitro* approached evaluation of the glycemic index**. This method is based on a measure by High Performance Liquid Chromatography (HPLC) of the glucose release after given times of enzymatic digestion.

The *in vitro* measure of the glycemic index is estimated after an enzymatic digestion of the food that mimic the small intestine digestion. The enzymes used in that method are listed in the next board.

Enzymes names	Functions
Pepsine	Cleaves proteins preferentially in C terminal of the Phe, Leu, Glu residues, allowing a better access to their substrate to the other enzymes.
Pancreatine	Composed by a mixture of enzymes such as amylase, trypsin, lipases, ribonucleases and proteases, pancreatine allows to mimic the small intestine digestion.
Amyloglucosidase	Releases the glucose of the starch
Invertase	Converts free carbohydrates into inverted sugars

After 20 minutes of enzymatic reaction, sugars with fast assimilation (RAG) are measured by ionic chromatography.
First, an experimental calibration curve has been developed from foods appearing in the Foster-Powell and al. table *(International table of glycemic index and glycemic load values : 2002. K. Foster-Powell, S. HA Holt and J. C. Brand-Miller, Am. J. Clin. Nutr. 2002 ; 76 : 5-56).*
This calibration curve has been established by correlating the in vivo glycemic index values of the table with the rate of RAG obtained experimentally with the digestion method.

OBJECTIVE AND INTEREST OF MEASUREMENTS *IN VITRO*: to give a qualitative estimation to finally:

- Give an idea of the food hyperglycemiant ability in the process of development and thus predict, in the context of an *in vitro* evaluation, in which category it will be classified: high glycemic index (>70), medium glycemic index (between 55 and 70), low glycemic index (<55)
- Be able to compare the food resulting from new technological process without or before realising an *in vivo* measurements (reduction of the product development time and cost)

The *in vitro* approached measure has the advantage of knowing quickly the impact of a formulation on the GI of the food, allowing thus the increase of the number of assays in Research and Development and finally limit the analytical costs and the length of the product development.