THE GLYCOSILATED HEMOGLOBIN

WHAT THE PATIENT NEEDS TO KNOW ?

WHAT IS THE GLYCOSILATED HEMOGLOBIN ?

The hemoglobin *is a protein found in the red blood cells of our blood its function is to carry the oxygen from our lungs to all the cells and tissues of our body.*

Like the rest of our proteins it may bound to the glucose and this happens also in the non diabetic population.

The percentage of the total hemoglobin what is bound to the glucose is known as **Glycosilated Hemoglobin** and remain constant during the whole life of the red blood cell; this percentage is going to change accordantly with the glucose fluctuations in our blood. **(Scheme 1).** ■

ARE THERE DIFFERENT TYPES OF HEMOGLOBIN ?

Yes, there are several types and each one has different ways to bound to the glucose. The **Hemoglobin A1** has three different fractions a, b, and c and it is the last one who has the more specific and stable bound, that is why usually we measure this fraction known as **HgbA1C** because it gives the best information about the average glucose levels in our blood during the last 2 or 3 months. ■

HOW USEFUL IS IT ?

It gives us the information about the **degree of blood glucose control** during the last 3 months, what is the average life expectancy of a red blood cell.

Sometimes if may show hyperglycemic periods during the day that were not evident with the self blood glucose monitoring that you routinely perform.

Every 1 % increase in your Hgb A1c means a rise of your average blood glucose levels between 30-33 mg %

You have to keep in mind that we are talking about a pondered average of you glucose levels that is why the information provided by the Hgb A1c test is **so important** and many times leads you to our diabetes team to discuss with us a change in your treatment. ■

HOW IMPORTANT ARE THE LAST 3-4 WEEKS BEFORE PERFORMING THE HgbA1c TEST ?

It is important to know that the previous month before taking the Hgb A1c test is **responsible for 50%** of the obtained result.

The reason is because in the continuous birth and removal of our cells the younger red blood cell are predominant and that explain why previous month influence the final result of the **Hgb A1c** test more than the rather previous 2 months.

This phenomenon may explain some unexpected results in your **Hgb A1c** test.

A positive consequence is that when you are struggling to improve your diabetes control you can see positive changes in you Hgb A1c test as soon as 4 weeks later. ■

WHEN AND HOW IS THE HgbA1c TEST PERFORMED ?

You can do it **any time** regardless of the time of the day because you don't need to fast.

Usually is done after a **venous blood sample** is taken in the laboratory.

It can also be done with a capilar sample (the same way you do when you perform SBGM) and the result, are available is very few minutes.

Sometimes you may also collect a capilar sample at home and send if to the laboratory by mail and this is specially convenient for people living far-away from their health care providers. ■

HOW OFTEN MUST BE DONE ?

It depends of the type of diabetes and the special needs of every person with diabetes.

As a minimum it must be done twice a year in type 2 patients with oral agents and 4 times a year in all the patients treated with insulin regardless the type of diabetes.

Special cases like diabetic women during pregnancy even more frequent testing may be needed. ■

WHICH IS THE RECOMMENDED HgbA1c NUMBER ?

Currently, we are still working on the standardization of the **Hgb A1c** methods that means that the "normal range" may be different from one laboratory to the other depending on the method used.

Different levels of **Hgb A1c** are recommended for each person.

It is not possible in the type 1 diabetic person with no residual insulin production to obtain the same Hgb A1c level as in a non diabetic without increasing the number and the severity of the hypoglycemic episodes; but several studies but several studies like the Stockholm or the **DCCT** has proven that any reduction is beneficial and we must target to get as closes as possible to the non diabetic range. Both mentioned studies have confirmed that there is a direct relationship between the high **Hgb A1c** levels and the risk of suffering long-term diabetic complication **(Scheme 2).**

By contrast in patients requiring insulin for diabetes control but no for survival and in patients treated with diet or oral agents alone it is not rare to obtain **Hgb A1c** levels in the non diabetic range.

There is no proof that a particular level of **Hgb A1c** can protect you absolutely from developing late diabetic complication, but there are some papers in the diabetes literature suggesting maybe there is "a critic level" at least for some diabetic complication such as retinopathy and nephropathy.

It is up to 8 % where the risk is unacceptable high. ■

IS IT POSSIBLE TO OBTAIN FALSE HgbA1c RESULTS ?

Any situation that modifies the turnover of our red blood cell **may give a false result** in the Hgb A1c.

For instance: Severe bleeding, hemolitic anemia, splenectomy, high doses of vitamin C, high concentrations of ethanol, lead, poison, and some persons with special types of hemoglobin.

Recently, there has been developed HPLC (high pressure liquid cromatogrphy) methods and many of theses interferences are easily rule out by a clear differentations between the different hemoglobin subtypes. **(Scheme 3).**

If there are unexplained results all this circumstances will be take in consideration by your doctor and he also has other tests to assess your glycemic control. ■

Scheme 1

RELATION BETWEEN HgbA1c AND GLYCEMIA IN DCCT

% HgbA1c	Glycemia Averages
4	60
5	90
6	120
7	150
8	180
9	210
10	240
11	270
12	300
13	330

Medium Level:
5 - 6,05 %

Non Diebetics Medium Level:
5,05 ±05 %

Normal Highest Limit:
6,05 %

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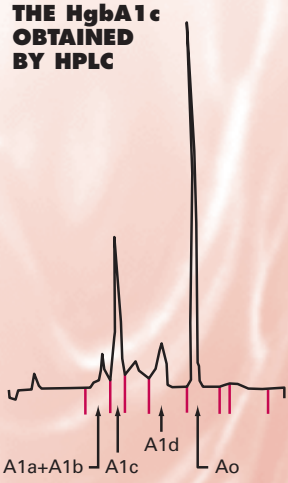
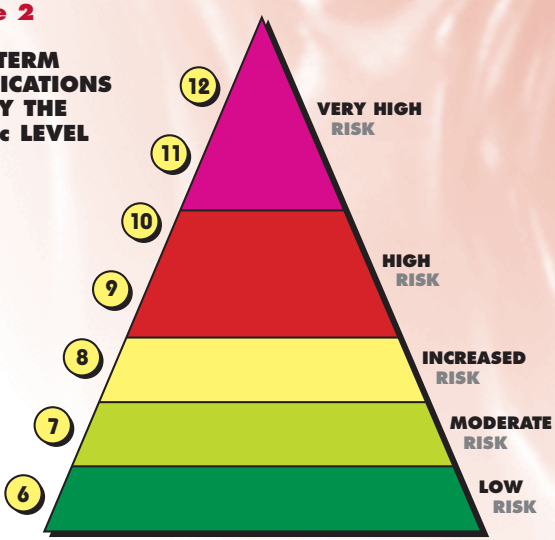
Scheme 3

DIFFERENT CROMATOPHY FRACTIONS OF THE HgbA1c OBTAINED BY HPLC



Scheme 2

LONG TERM COMPLICATIONS RISK BY THE HgbA1c LEVEL



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