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## REPORT

### Aging and Glycation

#### The Importance of Hemoglobin A1c Testing

By Steven V. Joyal, MD

Physicians and patients alike are beginning to realize that there is a valuable blood test that can help assess the level of glycation, a process implicated in accelerated aging.

The hemoglobin A1c test is a well known tool for following long-term glucose control in patients with diabetes. However, the same blood test also helps identify age-accelerating glycation reactions in the body. The hemoglobin A1c blood test is thus useful in non-diabetics who want to guard against this destructive glycation process. Here, we'll examine the importance of making sure your hemoglobin A1c is in a safe range and what to do if it is not.



#### WHAT IS HEMOGLOBIN A1C?

Developed nearly 40 years ago, hemoglobin A1c is a common, readily available blood test that is used most frequently to assess glucose control in diabetic patients. This test provides information about glycation levels, which, if increased, is a key factor not only in diabetes and its complications, but also an important contributor to premature aging and disease risk.<sup>1-4</sup>

Measuring hemoglobin A1c is different from a single fasting blood glucose test, which only provides a snapshot of one's current blood sugar level and is subject to daily variation. In contrast, the hemoglobin A1c test shows the bigger picture of a weighted average of blood sugar levels over the past three to four months.<sup>5-7</sup> This simple test is thus a powerful measure of elevated long-term blood sugar and glycation levels, which scientists believe may be intimately involved in accelerated aging.<sup>8</sup>

However, this valuable tool is being dramatically underutilized in the context of aging. The hemoglobin A1c test measures the presence of glucose molecules that join hemoglobin in a destructive process called glycation. The formation of glycated hemoglobin in red blood cells is thus termed hemoglobin A1c. The hemoglobin A1c test therefore identifies the potential for age-accelerating glycation reactions in our bodies, which are implicated in many life-threatening diseases.<sup>8-11</sup> Glycation plays an important role in the development of diabetic retinopathy resulting in blindness, diabetic neuropathy resulting in nerve damage, and diabetic nephropathy resulting in kidney failure.<sup>12</sup>

#### WHAT YOU NEED TO KNOW: HEMOGLOBIN A1C TESTING

- While health-conscious people diligently monitor their blood cholesterol levels, many are overlooking a crucial blood test that monitors a key marker associated with premature aging and disease risk.
- Hemoglobin A1c, also called glycated hemoglobin, is a marker of long-term blood sugar levels. While it is widely used to monitor blood sugar control in diabetics, it also measures the level of age-accelerating glycation reactions in the body and has been largely overlooked for healthy individuals.
- In diabetics, maintaining hemoglobin A1c within a healthy range can reduce the risk of developing complications of the disease.
- Optimal hemoglobin A1c levels in healthy adults may be associated with protection from disease processes associated with glycation, such as heart disease, cancer, and neurodegeneration.
- While the American Diabetes Association recommends keeping hemoglobin A1c levels below 7%, those seeking aggressive disease protection should strive to maintain hemoglobin A1c levels at less than 5%.

## APPLICATIONS IN DIABETIC AND HEALTHY INDIVIDUALS

The hemoglobin A1c test is commonly used every three months to assess blood sugar control and glycation in patients with pre-diabetes or diabetes. This critical test also predicts future risk of developing diabetic complications largely caused by the damage of glycation upon tissues of the body.<sup>13</sup>

Scientists now believe that it is not only those with diabetes or pre-diabetes who should be concerned about the damaging effects of glycation in the body. New studies reveal that all of us may suffer from the damage inflicted by advanced glycation end-products (AGEs), which are formed when sugars bind with proteins or amino acids in the body. Recent research indicates that these damaging end products play a role in heart disease, cancer, neurodegeneration, and the aging process itself.<sup>8-11,14</sup> Thus, diligently monitoring hemoglobin A1c levels is essential for all adults who wish to identify excess glycation processes in their bodies and take measures to control and minimize glycation-induced damage.



### THE OPTIMAL LEVEL OF HEMOGLOBIN A1C

Higher long-term blood glucose levels adversely impact hemoglobin A1c: for example, a hemoglobin A1c of 6% roughly represents an average blood glucose level of 135 mg/dL, and 5% roughly represents an average blood glucose level of 90 mg/dL.<sup>15</sup> However, research shows that glucose is not the only factor involved in glycation. For example, a study in type 1 diabetic patients revealed that hemoglobin A1c showed significant variability and, in 60% of cases, a reverse relationship between glycation and average blood glucose level (for example, some individuals showed higher levels of glycation and lower relative levels of blood glucose). Clearly, more than just blood glucose impacts our bodies' level of glycation.<sup>16</sup>

Since the goal for many of us is a long, prosperous life free from dependency upon loved ones or nursing home caretakers, current scientific evidence suggests that aging people as well as people who have diabetes should aggressively monitor their hemoglobin A1c, striving for a value lower than 6.5%.<sup>17-20</sup> For optimal longevity (remember, diabetes is a form of accelerated aging), scientific research suggests that a hemoglobin A1c level of less than 5% is ideal.<sup>17,21</sup>

### GLYCATION AND ELEVATED HEMOGLOBIN A1C IN NON-DIABETICS

Glucose control may only explain part of the variability associated with hemoglobin A1c levels. In fact, a study in non-diabetics showed that the level of glucose control contributes only about 30% of the variability associated with hemoglobin A1c level.<sup>22</sup> This study of non-diabetic men and women with consistently high or low levels of hemoglobin A1c showed no consistent relationship for age, gender, or blood glucose levels (taken from the average of two sets of five different blood glucose readings) that would readily explain the difference between 'high' and 'low' hemoglobin A1c levels.<sup>22</sup> This suggests that while blood glucose level does contribute to glycation rate in non-diabetics, other factors like ingestion of dietary glycotoxins from foods cooked at high temperatures and poor antioxidant intake make significant contributions to age-accelerating glycation.



### TESTING FOR HEMOGLOBIN A1C IN AGING ADULTS

Aging individuals with a fasting glucose level above 85 mg/dL should consider having a hemoglobin A1c blood test in order to assess long-term blood sugar levels and to help identify the level of age-accelerating glycation occurring in the body.

Because of the lack of standardized measuring techniques among laboratories, hemoglobin A1c tests should be read by the same laboratory, or by labs that are standardized to the national DCCT reference method. If your hemoglobin A1c level is elevated above optimal, work with your health care practitioner to take aggressive steps to control this important factor involved in premature aging and disease.

Nutrients that most Life Extension members take already, such as lipoic acid, carnosine, and benfotiamine all help block glycation reactions in the body.

For those interested in optimal metabolic control and longevity, reducing blood glucose to an ideal range (between 70 and 85 mg/dL) along with achieving hemoglobin A1c less than 5% are important goals.

If you have any questions on the scientific content of this article, please call a Life Extension Health Advisor at 1-800-226-2370.

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