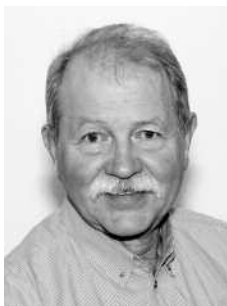


## **Discrepancies of blood glucose and HbA1c in diabetic patients – How to proceed in individual cases**

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Diabetes mellitus is defined as an heterogenous metabolic disorder with chronic hyperglycemia as leading symptom. Apart from clinical symptoms which may be unspecific, particularly in type 2 diabetes, both blood glucose and HbA1c values are used to confirm the diagnosis. Furthermore, both laboratory parameters are widely used to assess metabolic control. However, although both parameter measure different substances i.e. glucose indicating acute blood glucose concentration while HbA1c is an indirect measure for long-term hyperglycemia, both parameter is interpreted in a similar way. This may result in misdiagnosed or undiagnosed diabetes. As an example, in a young woman diabetes was diagnosed on the basis of an elevated HbA1c of 7.6% and treated with insulin. After one year the elevated values could be explained by a revisited history of the patient indicating a reduced erythrocyte life-span due to splenectomy after an accident. In case of laboratory values with no corresponding clinic the clinician may use both parameters to support the diagnosis. If there are discrepancies between glucose and HbA1c values an interference of the analytical measurement including preanalytical influences, may be present or HbA1c is influenced by the individual per se.

Particularly two conditions influence the HbA1c value:

1. reduced or increased erythrocyte life-span due to anemia (untreated as well as treated which may lead to enhanced erythropoiesis) or intravasal hemolysis either endogenous or induced by drugs or recent blood loss e.g. by accident or blood donation
2. pathological hemoglobins which may influence the erythrocyte life-span and possibly also the measurement dependent on the method used

None of these conditions influences or interferes with the blood glucose concentration/measurement.

While there is no laboratory parameter at present for the determination of erythrocyte life-span increased erythropoiesis may be estimated from an increased reticulocyte count. In case of pathological hemoglobins or other interference factors the determination of fructosamine may help to estimate the glycemia of the patient.

But also more general parameters influence the HbA1c value. These include age (increase), bad metabolic control (increase), eth-

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nicity e.g. afro-americans (increase) etc.

In case of pregnancy, liver cirrhosis or severe diabetic nephropathy/hemodialysis the HbA1c values are not valid. While plasma glucose is not influenced by the above mentioned factors, preanalytical factors are important for unbiased determination and interpretation of glucose values.

Most important factors are the inadequate handling of the glucose sample (special tubes are needed to prevent glycolysis) and the nutritional

state of the patient (fasting or postprandial).

Taken together, HbA1c and glucose measurement complement each other and should be used knowing the advantages and disadvantages of either parameter. The knowledge should also include the different predictive value of both parameters e.g. HbA1c correlates with diabetic microvascular complication, particularly diabetic retinopathy, while a pathological oGTT may predict an increased risk for cardiovascular complications.