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Introduction to Glycated Albumin
**Albumin: Protein synthesized in the liver**

- Mol. Weight of 66 kDa
- Half Life: **17-23 days**
- Distribution in the body
  - 35-40% in plasma
  - 50-60% extravascular
- Concentration: 3.5-5.5 g/dL
- Functionality:
  - Maintenance of serous colloidal osmotic pressure
  - Carriage of poor solubility substances (i.e. fatty acid, bilirubin and drugs)
  - Anti-oxidant effect  
    
    Bourdon E et. al. The FASEB Journal 1999; 13: 233-244.
**Glycated Albumin (GA)**

- Under hyperglycemia conditions all proteins are subject to a non enzymatic glycation process.
- Albumin is one of the proteins more affected by glycation because of its high concentration and long half life.
- Glycated Albumin (GA) represents 80% of the overall glycated proteins in human serum.

Albumin glycation effects

• Being Albumin distributed in the whole body, its Albumin glycation will reflect glycation status of the whole body

• Albumin glycation would reduce drug binding properties and antioxidrant properties

Albumin glycation effects

- **High level of Glycated Albumin** may induce irreversible cellular damages partially responsible for **clinical complications of diabetes mellitus** (retinopathy, nephropathy, neuropathy, micro and macro vascular outcomes)

Glycated Albumin Limitations

- In those clinical conditions which may influence Albumin levels (i.e. Thyroid disfunctions, Nephrotic syndrome, Cirrhosis, Non Alcoholic Steato-Hepatitis)


- Other factors to consider: age, BMI, nutritional status, smoke, Hyperuricemia
## Methods for the quantification of glycated serum proteins

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Method for the quantification of Glycated Albumin (GA)

Enzymatic method coupled to a colorimetric output by ketoamine oxidase and an albumin specific protease.

(developed by Asahi Kasei Pharma Corporation)

It is an easy and reliable fully automated method allowing accurate and precise determination of Glycated Albumin in a routine laboratory.
Glycated Albumin
Clinical Value
Hyperglycemia diagnosis and monitoring tools

- **HbA1c**: Past 2~3 months = Long-term
- **CGMS**: Past 1 month
- **SMBG**: Snapshot = Short-term

**PAST**

- 12 Weeks
- 8 Weeks
- 4 Weeks
Glycated Albumin as a hyperglycemia diagnosis and monitoring tool

- **Short to intermediate integrated glycemic control** thanks to GA sensibility to short term glucose variations which might not be detected by fasting plasma glucose testing (single point) or disappear in the HbA1c testing (2-3 months average)


Albumin glycation rate is 10 time higher than Hb
Glycated Albumin as a hyperglycemia diagnosis and monitoring tool

- **Glycemic control in neonatal diabetes (NDM):** HbA1c is influenced by age-related changes in Fetal Hb and does not accurately reflect glycemic control.

Glycated Albumin as a hyperglycemia diagnosis and monitoring tool

Patient: female 58-y-old
Presented at the emergency department

Symptom: fatigue, dyspepsia and faintness
(Insulin therapy was stopped by herself)

BG: 671mg/dL, HbA1c 19.5 %, GA 94.1%

Hospitalized and start intensive insulin therapy

Glycated Albumin in diabetic nephropathy

- GA is a glycemic control marker more accurate than HbA1c in peritoneal dialysis and hemodialysis patients

- Kidney deficiency is often associated to a reduction of erythrocytes half-life: HbA1c may underestimate average glucose while GA doesn’t


Glycated Albumin in Gestational diabetes

- HbA1c decreases in the first quarter pregnancy, then it increases
- Non diabetic pregnant women show HbA1c levels lower than non pregnant women, due to glycaemia deficiency in the first quarter and iron deficiency in the second quarter
- Being GA independent from the above variations, it can be a better tool for glycemic control of women with gestational diabetes
- GA can also be useful to better monitor diabetes during pre-pregnancy

Glycated Albumin in Anemia and Hemoglobinopathy

- HbA1c underestimates average glicemia in case of anemia; therefore GA would be preferrable in terms of accuracy for the monitoring of diabetic patients affected by anemia.

- This also applies to post hemorrhages, hemolytic anemia, post transfusions and hemoglobinopathy.


Glycated Albumin and Diabetes Microvascular disease progression

Figure 1 — Nathan et al. (7) provide compelling data to suggest the combination of glycated albumin and HbA1c strengthens the association with microvascular end points such as nephropathy (e.g., albuminuria) and retinopathy (e.g., nonproliferative retinopathy). The strength of this association was stronger than that for CVD and implies that a glycemic staging system may be especially useful for understanding diabetes microvascular disease progression such as kidney and eye disease.
Conclusions

• Diabetes is managed by clinicians with few tools coming from laboratory medicine

• Glycated Albumin is an analytically robust and reliable assay, easy to run on routine chemistry analyzers, with no need of sample pre-treatment

• Glycated Albumin is mid-term glycation indicator independent from Hb abnormalities, therefore can be placed side by side to HbA1c in all those clinical settings where HbA1c can be critical (renal failure, anemia, erythrocyte abnormalities, pregnancy)
Conclusions

• In naïve diabetic patient diagnosis, Glycated Albumin could represent a further tool to assess glycation exposure in a shorter time frame

• Glycated Albumin can also find room in the pre-diabetic status assessment, where average glucose concentration is getting higher and higher, but HbA1c value is not yet affected
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Your Results.