

Total Antioxidant Status (TAS) and Glutathione Reductase (GR) in Geriatric Subjects

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Introduction

Oxidative damage has been implicated in the aetiology or pathogenesis of a large number of diseases and tissue injury⁽¹⁾. The antioxidant defences interact to form an integrated system⁽²⁾, therefore, it may be inappropriate to rely on measurement of a single component as an indicator of the functioning of the entire system. The Randox Laboratories Total Antioxidant Status (TAS) kit is designed for evaluating the overall performance of the antioxidant system. Recently, reference ranges were published for TAS and a number of other antioxidant parameters, from a group of working age subjects in the city of Vienna⁽³⁾. Unpublished results from this study suggested that TAS may decline with age. The purpose of the present study was, therefore, 1: to establish reference ranges for TAS and Glutathione reductase (GR) from a sample of the Viennese geriatric population, and 2: to correlate the TAS value with certain clinical chemistry data, and to compare the results for the geriatrics with those for the working age group.

Methods

Samples: Serum samples were collected from 60 women and 17 men housed in a care centre for the elderly in Vienna. Mean age was 84.69 ± 9.92 years (min. = 61, max. = 102; 95% confidence limit = 2.18). There was no significant sex difference in age ranges. Mean weight was 55.03 ± 11.96 kg (min. = 35, max. = 85; 95% confidence limit = 2.65). Mean height was 160.87 ± 9.02 cm (min. = 140, max. = 190; 95% confidence limit = 2.0).

Experimental procedures: Samples were assayed for: Total Antioxidant Status (TAS, Randox Product No. NX2332), glutathione reductase (GR, Randox Product No. GR2368), leucocytes, platelets, RBCs, haematocrit, MCH, MCHC, MCV, haemoglobin, BUN, creatinine, potassium, sodium, chloride, calcium, phosphorus, CPK, LDH, AST, ALT, gamma-GT, ALP, Cholesteryl esterase (CHE), bilirubin, total protein, albumin, amylase, lipase, glucose, cholesterol, TG, HDL-cholesterol, LDL-cholesterol, Lp(a), antibodies to oxidised LDL (OLAB), uric acid, iron, TSH, free T₄, total T₃, CRP, thyroid microsomal antigen and thyroglobulin.

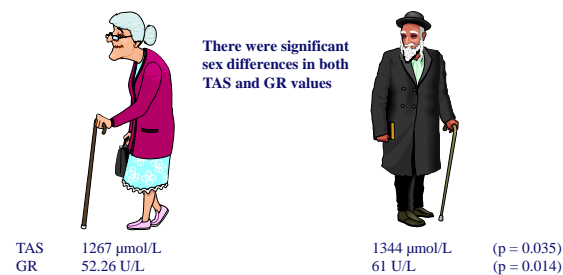
Correlations were calculated using least squares linear regression; Student's t-test (assuming equal variance) was used to determine whether differences between means were significant, with p 0.05 taken as the significance level.

Results

A number of the subjects studied were taking a variety of drugs including: diuretics, antihypertensives (-blockers, ACE inhibitors), cardioactives (digitalis, Ca antagonists, nitrates). TAS and GR were not significantly different in those receiving any of these drugs compared to those not receiving the drug.

Reference Ranges for TAS and Glutathione Reductase in Geriatric Subjects
Table 1.

Analyte	Mean	SD	Reference Range (Mean ± 2SD)	Max	Min	95% Interval
TAS	1284 µmol/L	153	978 - 1591	1620	850	34
Glutathione Reductase	55.0 U/L	12.9	29.2 - 80.7	123.2	34.3	2.9



Correlations in Descending Order of Statistical Significance of Clinical Chemistry Parameters with TAS in Geriatric Subjects
Table 2.

Analyte	r	p
Uric Acid	0.667	3.64 x 10 ⁻¹¹
Total Protein	0.646	2.17 x 10 ⁻¹⁰
Albumin	0.593	1.36 x 10 ⁻⁸
Haemoglobin	0.424	0.0001
Creatinine	0.424	0.0001
CHE	0.400	0.0003
Calcium	0.322	0.004
Glutathione Reductase	0.288	0.011
Sodium	0.273	0.017
BUN	0.264	0.02
LDH	0.258	0.024
Cholesterol	0.255	0.025
LDL-Cholesterol	0.236	0.039

All correlations were positive

Comparison of TAS Between Sexes and Age Groups

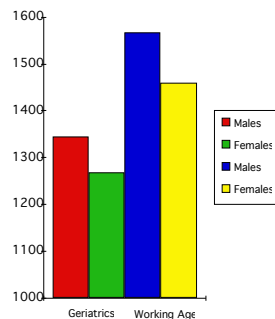


Fig. 1

Comparison of GR Between Sexes and Age Groups

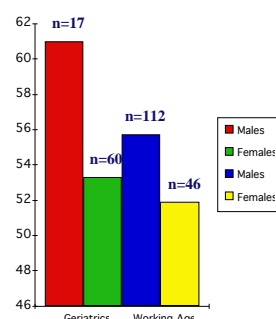
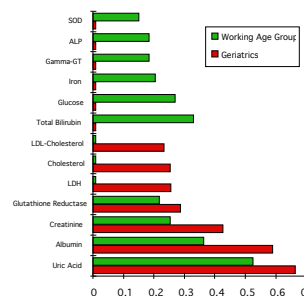


Fig. 2

Comparison of Correlations between TAS and clinical Analytes for Geriatrics and Working Age Groups



Discussion

1. Comparison of TAS and GR Between Sexes and Age Groups from the same Geographical Area

TAS and GR were higher in male geriatrics than in females. The same sex difference in TAS was also found in the working age group. (Fig. 1)

The sex difference in GR in the geriatrics was approximately twice that found in the working age group. There was no statistically significant difference in mean GR between the whole geriatrics group (males and females) and the whole working age group. (Fig. 2)

TAS was significantly lower in geriatrics than in the working age group (1284 µmol/L vs 1536 µmol/L, p <0.05). (Fig. 1)

This may be due to age-related declines in certain analytes which contribute to the TAS value (eg. albumin, see below). A rank analysis of TAS vs age in the working age group suggested that TAS does decline with age. This is supported by the results of this study, however, longitudinal studies are required to properly assess changes in TAS with age.

2. Correlations Between TAS and Other Factors in Geriatrics and Comparison with Working Age Group

TAS correlated significantly with a number of factors (Table 2). Several of these analytes (eg. albumin, glutathione reductase, uric acid) are known to contribute to the antioxidant system, however, others (eg. calcium, cholesterol) may exert their effect through indirect mechanisms. It may be that elevation of certain of these analytes leads to oxidant-based pathology and that the antioxidant system is up-regulated to try to counter their effects.

Correlations between TAS and various clinical chemistry parameters were somewhat different in the geriatric and working population groups (Fig. 3).

Although haemoglobin and albumin were significantly higher in the younger population group, all other overlapping parameters studied (creatinine, AST, ALT, Gamma-GT, ALP, bilirubin, glucose, cholesterol, triglycerides, HDL-cholesterol, LDL-cholesterol, OLABs, uric acid and iron) were not significantly different in the two groups.

Conclusions

- TAS and GR in male geriatrics were significantly higher than in females.
- TAS for the whole group was significantly lower than TAS in a group of subjects of working age, although GR was not significantly different in the two groups.
- TAS correlated with a number of parameters, including enzymes, proteins and small molecules, suggesting that TAS is composite value based on different contributions from a number of different analytes.
- The results also suggested that the contributions of these various analytes to TAS may alter with age.

References

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