

Serum glycoproteins in patients with hypo- and hyperthyroidism

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Glycoproteins, widely distributed in animals, plants, microorganisms and viruses, are formed from covalent association of carbohydrate moieties (glycans) with proteins [1, 2]. A high content of carbohydrate components protects probably the glycoprotein molecules against the deproteinizing agents like perchloric, sulphosalicylic or trichloroacetic acid [3]. Serum glycoproteins resistant to perchloric acid are called seromuroid [4]. Estimation of seromuroid in blood serum of patients with various diseases is widely applied in medicine [4 - 6].

Previous experimental studies have shown that thyroid hormones influence the serum glycoprotein concentration [7]. It was also found that the thyroid state affects markedly glycoprotein content in liver subcellular fraction [8].

The present study was designed to elucidate the pattern of glycoprotein concentrations in blood serum of patients with hypo- and hyperthyroidism. Glycoprotein concentration was measured by estimation of seromuroid and protein-bound carbohydrates: hexoses, hexosamines and sialic acids.

The studies were carried out on 15 patients with hypothyroidism, aged 25 - 46 years, and 30 patients with hyperthyroidism, aged 27 - 50 years, prior to the beginning of treatment. Diagnosis was made on the basis of medical examination and laboratory studies, including serum free and total hormone contents, TSH and cholesterol concentrations. Blood was obtained from the ulnar vein and serum was

separated by centrifugation. Perchloric acid-soluble proteins were determined according to Winzler as described by Schmidt [9]. Protein-bound hexoses were assayed by the method of Carney [10], protein-bound hexosamines were estimated by the method of Wagner [11] and sialic acids according to Montreuil *et al.* [1].

Results of carbohydrate estimation were expressed as galactose, glucosamine and *N*-acetylneuraminic acid, respectively. Standard substances were obtained from Sigma (U.S.A.). Total protein was determined by the method of Lowry *et al.* [12].

Control values were obtained in studies on 20 healthy subjects, aged 24 - 48 years.

The obtained results were subjected to statistical analysis using Student's *t*-test. Samples representing the population of the patients with hypo- or hyperthyroidism, as well as of healthy individuals were analyzed with the Shapiro-Wilk test, described by Domański [13], to verify the assumption of normal distribution.

It was found (Table 1 and 2) that hyperthyroidism is associated with an increase and hypothyroidism with a decrease in the content of all the investigated serum glycoproteins. Glycoprotein abnormalities were specific and did not result from changes in total protein. Our findings are comparable with the previous investigations of disturbed thyroid function on animal model []. Drózdź *et al.* [7] reported that serum glycoprotein changes were accompanied by tissue glycoprotein abnormalities. It is possible that similar alterations in tissue con-

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Table 1
Glycoprotein concentrations in blood serum of patients with hyper- and hypothyroidism
 Statistical significance ($P = 0.05$) was estimated with Student's *t*-test

	Seromuroid (μ moles of tyrosine per l)	Protein-bound hexoses (mmoles/l)	Protein-bound hexosamines (mmoles/l)	Sialic acids (mmoles/l)
A) Controls n = 20	348.85 \pm 44.34*	6.95 \pm 0.77	5.87 \pm 0.73	2.28 \pm 0.26
B) Hyperthyroidism n = 30	465.58 \pm 81.38	8.72 \pm 0.79	6.30 \pm 1.24	2.79 \pm 0.40
C) Hypothyroidism n = 15	238.83 \pm 40.02	5.57 \pm 0.84	5.00 \pm 0.83	2.01 \pm 0.29
Difference B - A (%)	116.73 (33.46)	1.77 (25.47)	0.43 (7.33)**	0.51 (22.37)
Difference C - A (%)	-110.02 (-31.54)	-1.38 (-19.86)	-0.87 (-14.82)	-0.27 (-11.84)

*Mean values \pm S.D. are presented;

**Statistically insignificant

Table 2
Glycoprotein concentrations in relation to total protein concentration in patients with hyper- and hypothyroidism
 Statistical significance ($P = 0.05$) was estimated with Student's *t*-test

	Seromuroid (μ moles of tyrosine per 1 g of total protein)	Protein-bound hexoses (μ moles/g of protein)	Protein-bound hexosamines (μ moles/g of protein)	Sialic acids (μ moles/g of protein)
A) Controls n = 20	6.22 \pm 0.72*	112.33 \pm 12.44	94.88 \pm 11.80	36.87 \pm 4.28
B) Hyperthyroidism n = 30	7.86 \pm 1.32	147.22 \pm 13.34	106.36 \pm 21.78	47.17 \pm 6.69
C) Hypothyroidism n = 15	4.09 \pm 0.68	95.36 \pm 14.38	85.60 \pm 14.21	34.48 \pm 5.02
Difference B - A (%)	1.64 (26.37)	34.89 (31.06)	11.48 (12.10)	10.30 (27.94)
Difference C - A (%)	-2.13 (-34.24)	-16.97 (-15.11)	-9.28 (-9.78)	-2.39 (-6.48)**

*Mean values \pm S.D. are presented;

**Statistically insignificant

tent of glycoproteins occur in patients with hypo- and hyperthyroidism.

The mechanism of the changes observed remains unknown. Glycoproteins as so-called acute-phase reactants are synthesized in the liver upon stimulation by interleukin-1 [14, 15]. Disturbances of this cytokine in thyroid diseases are unclear. Several cells within the body are believed to produce interleukin-1. These phenomena as well as the diagnostic value of

serum glycoproteins determinations need further investigations.

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