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### Glucosamine and Galactosamine in Human Serum Fractions

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The physiology of the protein-bound carbohydrates is little known and even the knowledge about the chemical composition of the carbohydrate complex is lacking. In this work an investigation on the aminosugars is made.

Determination of the ratio galactosamine:glucosamine was carried out with the method given by Gardell<sup>1</sup> and hexosamines were determined by the Elson and Morgan method as worked out by Blix<sup>2</sup>. The electrophoretic separation of proteins was carried out by means of paper electrophoresis followed by elution of the fractions. The mucoproteins were isolated according to Winzler *et al.*<sup>3</sup>. The mucoprotein preparation can be electrophoretically divided into three mucoproteins, named MP-1, MP-2 and MP-3 (Mehl *et al.*<sup>4</sup>) MP-1 has the same mobility at pH 8.6 as  $\alpha_1$ -globulin, the other two run slower.

In Table 1 the results of the galactosamine:glucosamine determinations are given as well

as the hexosamine content in per cent of the protein.

It is seen that the ratio is about 1:18 for normal sera as well as for  $\gamma$ -globulin and MP-1. MP-2 and MP-3 have not yet been isolated in sufficient quantities for analysis but on the base of the values for MP-1 and for MP-1+2+3 there is indirect evidence for a high galactosamine content.

The  $\alpha_1$ - and  $\beta$ -globulins can each be divided into two fractions, one precipitable with trichloroacetic acid (9%) or with perchloric acid (0.6 M) (fraction A). In the filtrates remains a fraction precipitable with phosphotungstic acid (fraction B). The amount of fraction B is about 10-20% of the whole  $\alpha_1$ - or  $\beta$ -globulins. The galactosamine:glucosamine ratio of fraction A was for  $\alpha_1$ -globulin 1:17.4 and for  $\beta$ -globulin 1:17.8. Thus it is seen that galactosamine and glucosamine are present in most fractions in a constant ratio of 1:18 but the mucoproteins following  $\alpha_1$ - and  $\beta$ -globulin have a higher content of galactosamine.

1. Gardell, S. *Acta Chem. Scand.* 7 (1953) 207.
2. Blix, G. *Acta Chem. Scand.* 2 (1948) 467.
3. Winzler, R. F., Devor, A. W., Mehl, J. W. and Smyth, I. M. *J. Clin. Invest.* 27 (1948) 609.
4. Mehl, J. W., Humphrey, J. and Winzler, R. *J. Proc. Soc. Exptl. Biol. Med.* 72 (1949) 106.

Table 1. The content of hexosamine in serum protein fractions and the relative amounts of galactosamine and glucosamine.

	Hexosamine, % of protein	Galactos- amine $\mu\text{g}$	Glucos- amine $\mu\text{g}$	Gal./Gluc. ratio
Normal serum 1		19.6	366.6	1:18.7
Normal serum 2		29.9	533.1	1:17.8
MP-1	11.5	18.9	335.8	1:17.8
MP-1+2+3	8.9	47.5	417.5	1:8.8
$\alpha_1$ -glob.	3.76	48.2	751.2	1:15.6
$\beta$ -glob.	2.22	40.0	545.4	1:13.6
$\gamma$ -glob.	1.48	15.8	286.3	1:18.1