In vivo and in vitro Effect of Sulfathiazole on Serum Glycoproteins

Studying the effects of alimentary lipaemia, we observed[1] that the neutral carbohydrate content of albumin and β-globulin decreased while that of α-1, α-2 and γ-globulins increased. These modifications may be explained as due to a possibility of a physico-chemical competition between the lipides and carbohydrates for the transport surfaces of plasma proteins. An essential condition of such a competition is the unstable binding of some carbohydrate components by the carrier proteins. The purpose of this study is to obtain new data regarding the nature of carbohydrate-protein interactions by modifying the binding capacity of plasma proteins by sulphathiazole.

In vitro effect of sulphathiazole: Examinations were performed on 12 sera. 2 mg of sulphathiazole was dissolved in 1 ml of serum, the mixture was incubated for 1 h at 37 °C. The paper electrophoretic glycoprotein fractions were determined from the original sera and from the sera treated with sulphathiazole (Whatman 1 paper, barbital buffer at pH 8.6 and 0.05 ionic strength, PAS method, automatic scanning of the strips). The presence of sulphathiazole does not influence the intensity of the PAS reaction.

In vivo effect of sulphathiazole: Fourteen patients suffering from chronic diseases were examined. Before and after 1 h following the i.v. injection of sulphathiazole (0.02 g/kg) we determined the electrophoretic patterns of the glycoprotein fractions.

The statistical evaluation of the results was performed using Student's t test. The results are summarized in the Table.

	Glycoprotein fractions % Before sulphathiazole a.m.	s.e.m.	After sulphathiazole a.m.	s.e.m.	$P <$
In vitro					
Albumin	6.7	± 1.1	3.7	± 0.4	0.01
α-1 globulins	17.6	± 1.4	14.9	± 1.5	0.01
α-2 globulins	33.2	± 1.4	35.6	± 1.3	0.001
β-globulins	27.9	± 1.8	30.0	± 2.3	0.05
γ-globulins	14.6	± 1.5	15.8	± 1.7	0.50
In vivo					
Albumin	6.8	± 1.6	3.4	± 0.9	0.01
α-1 globulins	16.5	± 1.2	13.7	± 0.9	0.01
α-2 globulins	29.2	± 1.7	33.1	± 2.5	0.02
β-globulins	28.2	± 1.4	29.7	± 1.5	0.30
γ-globulins	19.3	± 1.2	20.1	± 1.5	0.40

a.m., arithmetical mean; s.e.m., standard error of the mean.

The statistical evaluation of the results was performed using Student's t test. The results are summarized in the Table.

In 1938 BENNHOLD[2] demonstrated for the first time the prontosil binding-capacity of albumin. Subsequently a number of authors enlarged our knowledge of the protein-sulphamide interactions. Recently, CLAUSEN[3] separated the sulphonamide-binding proteins by gel filtration on Sefadex column and pointed out that 71.5% of the sulphamide was bound by prealbumin, albumin and α-1 glycoprotein fraction; 5.6% by α-2 macroglobulin and 22.6% by non-antigenic polypeptides.

The lowering of the carbohydrate content of sulphamide carrier proteins, a phenomenon observed after the i.v injection of sulphathiazole as well as after its dissolution in serum, shows that some carbohydrate fractions are bound to proteins only by physico-chemical forces (van der Waals' and hydrophobic interactions, hydrogen bonding). This ensures a considerable variability for the surface of glycoproteins. The variability of the neutral glucide content of electrophoretic glycoprotein fractions is not in accordance with the opinion that all carbohydrate in glycoproteins is firmly bound to the intact protein[4]. This contradiction points to the unsatisfactory delimitation of the glycoprotein notion.

Zusammenfassung. Durch Sulfathiazolzugabe in vitro oder durch Sulfathiazolbehandlung in vivo wird der Glycoproteingehalt des Albumins und der α-1-Globuline reduziert.

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Effects of X-Irradiation on Ribonucleases in Blood Plasma

Enzymes capable of degrading RNA are present in blood[1,2], and in humans the alkaline RNAse activity is divided almost equally between the cells and the plasma[2]. An inhibitor of this enzyme is also present in erythrocytes[2].

RNAse levels in various tissues show large increases after irradiation[3–5]; in the case of alkaline RNAse these appear to at least partially result from the increased enzyme synthesis induced by a neuro-endocrine reaction stimulated by the stressing action of ionising radiation[5,6]. It was therefore decided to study the effects of X-irradiation on the RNAse levels in the plasma of rats and guinea-pigs, in order to examine whether the changed enzyme levels in tissues were accompanied by changes in plasma enzyme levels, with which they could be correlated.

Acid and alkaline RNAse activities were estimated by measuring the rate of degradation of RNA to acid-soluble nucleotides at pH 5.6 and 7.7 respectively, as described previously[6,7]. The animals were irradiated with 700 R of 250 KV_p X-rays filtered through 2 mm copper, and killed 18 h later; blood was taken from the heart by syringe. The control rats were sham-irradiated.

There was no detectable amount of the inhibitor of alkaline RNAse activity in plasma, but after haemolysis