

## Insulin-like Activity of a Dialyzable Factor in Human Blood Plasma\*

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Human blood serum or plasma exerts an insulin-like activity shown by the stimulating effect on glucose uptake of the rat diaphragm *in vitro*. Based on this observation a method for determination of the insulin content in plasma or serum has been worked out by Groen *et al.*<sup>1</sup> and later by others. However, a definite proof that the effect of serum is due solely to the content of insulin is lacking. This can be questioned from the fact that wide variations in values obtained by different investigators have been reported, as well as from a theoretical point of view.

The present investigation has been undertaken to show if the insulin-like activity of plasma specifically can be related to the content of insulin or if other compounds contribute to this effect. The following experimental technique has been adopted. Blood is drawn into a syringe previously heparinized and plasma immediately separated by centrifugation. A sample of plasma was dialysed against Krebs Ringer solution for 12 h at +2 °C. The solution was buffered either with bicarbonate or with phosphate to pH 7.4 and glucose added to a final concentration of 140 mg per 100 ml. The effect of plasma and dialysate on glucose uptake of the rat diaphragm has been investigated by a procedure used for some years in our laboratory.

The dialysate from serum as well as from plasma stimulated glucose uptake in the isolated rat diaphragm. This was a significant and reproducible effect. As an average of 10 experiments 30 % stimulation was obtained. The stimulating effect was stable against heat. Thus, if the dialysate was kept at 80 °C for 20 min or boiled for 5 min the stimulating effect was increased by another 30 %. This indicated thermal inactivation of an inhibitory factor in the dialysate. The stimulating effect in the dialysate was not due to insulin. 0.1 unit crystalline insulin added to plasma did not influence the effect of the dialysate on glucose uptake of the rat diaphragm and insulin could be recovered in the plasma inside the bag after dialysis. — The insulin like effect of plasma was reduced after dialysis. After prolonged dialysis

for 48 h even inhibition of the glucose uptake in rat diaphragm by the dialysed plasma has been observed.

So far, we have not been able to confirm that the insulin-like activity of plasma solely is due to the content of insulin. Of particular interest is that a dialysable factor from plasma or serum exerts insulin-like activity in the rat diaphragm method. Further studies on the nature of this factor is in progress.

I. Groen, J., Kamminga, C. E., Willebrands, A. F. and Blickman, J. R. *J. Clin. Invest.* **31** (1952) 97.

## The Interaction of Cysteamine and Cysteine with various Carbonyl Compounds\*

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Numerous important metabolites and several therapeutic agents possess reactive carbonyl groups. A study of the interaction of thiols with carbonyl compounds has therefore been undertaken.

In the present paper data on the interaction of the 1-mercapto-2-amines cysteamine and cysteine with several carbonyl compounds, will be reported. The procedure previously described for the analysis of thiol-disulphide interactions<sup>1,2</sup>, was found suitable for this purpose. The sulphur labeled thiols were incubated with the carbonyl compound at 37 °C and the desired pH. After acidification the labeled products were separated from the reactants by paper electrophoresis in phthalate buffer at pH 2.

The reaction mechanism has been studied in some detail in the system cysteamine and glyceraldehyde. It was observed that at pH 6.8–7.4 the rate of formation of the labeled product followed the kinetics of a bimolecular one-way reaction of the type  $A+B \rightarrow C$ . No evidence for the formation of dithials was

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