

THE EFFECT OF AUTOCLAVED AND UNAUTOCLAVED SOLUTIONS OF DEXTROSE ON HEPARIN ANTICOAGULANT ACTIVITY

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Changes in the anticoagulant activity of heparin measured in the first few hours after adding it to dextrose solutions have been reported (Jacobs & others, 1973; Okuno & Nelson, 1975; Anderson & others, 1977), but differences in the observed types of changes have remained unexplained. One factor which has not received attention is the dextrose solution; proprietary sterile dextrose solutions have always been used, but dextrose undergoes decomposition on autoclaving (Taylor & others, 1971) and dextrose solutions so sterilised are likely to vary in content of decomposition products. This variable is now taken up. Beef lung heparin, 1, (Upjohn 158 u.mg⁻¹) and pig mucous heparin, 2, (Leo, 155 u.mg⁻¹) were dissolved (30 u.ml⁻¹) in either autoclaved (115°/30 min) or unautoclaved 5% w/v dextrose solution which had been freshly made as for infusion. Heparin in these dextrose solutions was maintained at 37° and tested for anticoagulant activity (Yin & others 1973) hourly for 5h and at 24h. In autoclaved dextrose solution anti-coagulant activity rose (in 3 tests on 2 heparins 29 raised activities occurred in 30 hourly determinations) then returned to the original value; in unautoclaved dextrose solution lowered activity (27/30) preceded restoration. Percentage change at each hour, mean change for the five hourly determinations and hence the total mean difference were calculated. 95% confidence intervals for the medians of the total differences between autoclaved and unautoclaved were calculated using the Wilcoxon statistic. The medians were not equal ($p < 0.01$; Wilcoxon test). Clearly, the activity of heparin in autoclaved dextrose solution rises and in the unautoclaved it falls, returning in both to around 100% in 5 - 24h.

Table 1. Heparin activity change in dextrose solutions

	Mean change, %		Total mean difference, %	95% confidence interval for difference of medians
	Autoclaved	Unautoclaved		
Heparin 1	+9.3	-10.9	20.2	15 - 25
Heparin 2	+8.0	- 5.7	13.7	9 - 18

The presence of dextrose (or some unknown impurity) in the unautoclaved solution which contains no dextrose decomposition products causes a fall in heparin activity whilst autoclaved dextrose which contains 5-hydroxymethylfurfural and sugar acids changes that fall to a rise. Hence, dextrose and its autoclaving decomposition products interfere, but with apparently opposite effects, in the factor Xa anticoagulant assay used; whether by interaction with heparin, clotting components or mechanism is unknown. However, temporarily increased activity in the acidic autoclaved solution discounts acidic hydrolysis of heparin (which would be irreversible in any case) and Anderson & others (1977) found an unchanged metachromatic assay during the period of anticoagulant activity change. The autoclaving history and content of the dextrose solutions which earlier authors have not considered is a variable and could have contributed to the apparent conflict in the literature.

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