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The effect of insulin upon the rate of fermentation of glucose  
by yeast.

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The possible effect of insulin upon the rate of fermentation of glucose by yeast was studied. Five samples of insulin were tested in twelve experiments. The insulin used was supplied by Eli Lilly and Co., to whom we are indebted for this courtesy. Merck's highest purity glucose was used. The yeast employed was fresh baker's (Fleischmann's) yeast. The same volume of a solution of glucose was allowed to stand with measured quantities of yeast suspension at about 35° C, with and without the addition of insulin. Portions of the solutions were withdrawn from time to time and determinations made of the amount of sugar remaining as the action of the yeast proceeded. In some of the experiments a phosphate buffer solution was added. A summary of two out of the twelve experiments follows.

Starting with 100 cc. of 1 per cent glucose, and using 10 cc. of a 10 per cent suspension of yeast and 10 units of insulin in 10 cc. of water and no buffer, it was found that the sugar fell in three and a half hours from 0.80 gm. per 100 cc. of the original solution to 0.38 gm., in the solution without insulin, and from 0.81 to 0.37 gm. in the solution with insulin. In another case, starting with 50 cc. of 5 per cent glucose, using 10 cc. of 10 per cent yeast suspension, 40 units of insulin and 10 cc. of a phosphate buffer solution, the sugar fell after nineteen hours from 2.54 to 1.63 gm. per 100 cc. of the original solution, in the flask containing no insulin, and from 2.6 to 1.64 gm. where insulin was present.

These results are representative of seven experiments carried out with four samples of insulin, one of which contained no preservative and the others either toluene or trikresol. In using a fifth sample of insulin, one which contained chloroform as a preservative, a slightly greater loss of sugar was observed in the

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\* Introduced by Stanley R. Benedict.

solution containing insulin than in the one where no insulin was present. This amounted only to a difference of about 10 to 15 per cent of the original glucose after nineteen hours with yeast, and since the result was not duplicated with other samples of insulin we may assume that it was not due to the insulin itself.

The failure of insulin to exert any influence upon the rate of destruction of glucose by yeast would seem to furnish evidence in favor of the view that the action of insulin is not upon the glucose molecule itself. Were the glucose molecule altered through contact with the insulin it would seem probable that an alteration in the rate of fermentation should be detectable even though the change produced by the insulin were only in the nature of a shift in equilibrium in the  $\alpha$ ,  $\beta$  and  $\gamma$  glucose molecules present.

We are indebted to Professor S. R. Benedict, at whose suggestion the experiments were undertaken.

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#### **Studies of the physiological behavior of glyceryl tri-margarate (Intarvin). 1. Tests of the effects of Intarvin, in successive generations of albino rats, when added to balanced natural diets.**

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On August 2, 1923, we began two independent series of feeding experiments on albino rats (in tests continued through successive generations), to determine whether or not Intarvin, added to an ordinary balanced laboratory diet, in quantities ranging from five to twelve per cent of the total daily food intake, would induce any evidences of toxicity.

Eight normal female rats from one litter were originally separated into groups of four. One of two males, of practically the same size and vigor from an unrelated litter, was added to each of these two groups. One group received a balanced natural diet with a definite proportion of Intarvin mixed with the meat ration. The other group received the same natural diet under