8845 C

Increase in Production of Ethyl Alcohol by Yeast Treated with Ultra Violet Energy.

T. D. BECKWITH AND S. E. DONOVICK.

From the Department of Bacteriology, University of California at Los Angeles.

Observations regarding the effect of ultra violet light upon the fermenting power of yeast have been made by various authors. Owen and Morley[1] report an increase in activity of yeast after administration of appropriate dosages, while Tanner and Byerly[2] demonstrated an adverse effect. The first noted authors seem convinced that irradiation of the medium by means of ultra violet energy before introduction of yeast results later in enhanced growth of the microorganism, but Tanner and Byerly were unable to confirm this finding.

The object of our series of experiments was to determine whether exposure of yeast to ultra violet light is attended by subsequent increase in formation of ethyl alcohol.

For our purposes, we have utilized equipment set up as follows: The source of ultra violet was a quartz tube of approximately 24 inches length and one centimeter external diameter, of the type known ordinarily as "Cold Quartz" which operates with emission of very little heat and with much energy in the region of 2500-2800 A°. Placed outside of this quartz electrode, was an ordinary glass tube. Materials to be treated with the ultra light thus could pass between the outer wall of the quartz tube and the inner surface of that made of glass. The system was set up in a vertical position and fluids to be treated entered at the bottom and were withdrawn at the top. A variety of glass tubes of different diameters enclosing the inner quartz electrode permitted alteration of the thickness of layer of the fluid to be treated. Proper mixing during the period of treatment was brought about by intermittent surges of air introduced likewise at the lower end of the vertically placed apparatus.

For these experiments we have used purified brewers yeast. The crude material which contained both Torula and certain Acetobacters as contaminants, was plated on Sabouraud agar. From these plates were picked 7 good sized colonies of yeast which were all fished to a flask of sterile beer wort and allowed to ferment as a

1 Owen, W. L., and Morley, R. L., *Cent. f. Bakt. u. Parasitenk,* 1933, 2nd Abt. 88, 273.

2 Tanner, F. W., and Byerly, J. R., *Arch. Mikrobiol.,* 1934, **5**, 349.

composite culture of known yeast. Six different tests were made with this material and incorporated in this series were varying periods of exposure to the ultra violet radiation. Only one result will be included here, but the others were similar in outcome.

A flask containing 300 cc. of beer wort which had been sterilized in the autoclave was inoculated with the culture of pure yeast and then was incubated for 36 hours at 37°C. After thorough shaking, 150 cc. of this culture then were removed for treatment with the ultra violet. Details of the radiation were as follows: Thickness of the layer at time of treatment, 1.15 cm. Period of treatment per cc., 1.4 seconds. After such exposure, 125 cc. of the yeast culture then were added to 1600 cc. of beer wort which had been sterilized previously by intermittent steaming. 125 cc. of the untreated culture were placed in a similar amount of wort for control. Incubation then proceeded at 28°C. In each experiment, there were removed from the fermenting preparations samples for alcohol determination at specified times. The alcohol computations were made immediately according to the procedure of the official methods of the Agricultural Chemists. Specific gravity also was read with correction for temperature. The periods of observation extended from 2 to 5 weeks. No counts of culture were made since yeasts clump with the result that plate determinations are of little value. Direct counts do not allow discrimination between live and dead cells.

When a pure culture of yeast in beer wort is exposed to the effect of ultra violet energy as demonstrated in Table I, the initial effect

TABLE I.

The Specific Gravity Readings and Production of Ethyl Alcohol of Pure Yeast Culture in Beer Wort After Treatment with Ultra Violet Radiation. Control Untreated.

	Specific gravity		% ethyl alcohol	
Days	Treated	Control	Treated	Control
1	.9975	.9959	0.50	1.60
3	.9953	.9943	2.00	2.70
5	.9944	.9938	2.60	3.05
7	.9944	.9940	2.60	2.90
9	.9928	.9939	3.75	2.95
11	.9935	.9935	3.25	3.25
14	.9933	.9933	3.40	3.40
16	.9934	.9936	3.30	3.15
18	.9931	.9935	3.50	3.25
21	.9927	.9931	3.80	3.50
23	.9932	.9933	3.45	3.40
25	.9932	.9935	3.45	3.25
28	.9930	.9933	3.60	3.40
30	.9933	.9939	3.40	2.95
32	.9937	.9945	3.10	2.55

is to depress ability to form ethyl alcohol. In turn this phase is followed by increased fermenting activity after some days and this increase in production of alcohol is maintained thereafter. Additional experiments showed that over-intense exposure weakened the yeast so that fermentation induced by it thereafter was depressed. Very short exposures on the other hand, produce no evident effect whatever.

This increase in production of ethyl alcohol is due to the influence of the ultra violet energy upon the yeast itself and is not brought about by treatment of the wort. This was demonstrated by irradiating the beer wort under conditions identical to those already outlined. When such wort then was inoculated with untreated yeast, there was no appreciable difference between the amount of alcohol produced here and that formed by similar amounts of normal yeast in untreated wort.

8846 P

Effects on Blood Pressure of Injection of Kidney Extracts of Dogs with Renal Hypertension.

T. R. HARRISON, A. BLALOCK AND M. F. MASON.

From the Departments of Medicine, Surgery and Biochemistry of Vanderbilt University, Nashville, Tenn.

A rise in blood pressure may be produced in dogs either by partial obstruction of the renal arteries[1] or by ligation of the ureters.[2] Since the latter procedure often causes a marked decline in the renal blood flow,[3] it seems likely that the hypertension is in both instances related in some way to ischemia of the kidneys. It was shown by Tigerstedt and Bergman[4] that saline extracts of the kidney of rabbits produced a sustained rise in blood pressure when injected into other rabbits. The object of our experiments was to determine whether extracts prepared from ischemic kidneys, removed from dogs with hypertension, had a greater pressor effect than similar extracts of normal kidneys.

The freshly removed kidneys were chopped up with scissors and

1 Goldblatt, H., Lynch, J., Hanzal, R. F., and Summerville, W. W., *J. Exp. Med.*, 1934, **59**, 347.

2 Harrison, T. R., Mason, M. F., Resnik, H., and Rainey, J., *Trans. Assn. Am. Phys.* In press.

3 Levy, S. E., Mason, M. F., Harrison, T. R., and Blalock, A. In press.

4 Tigerstedt, R., and Bergman, P. G., *Skand. Arch. Physiol.*, 1898, **8**, 223.