zoate caused but very slight inhibition of growth in the dark. On the other hand when exposed to direct sunlight even 1:1000 and 1:1250 of sodium benzoate produced a distinct retardation of fermentation, and the degree of inhibition was very much greater than in control experiments with sunlight alone, without the benzoate. The inhibitory action of the sodium benzoate was increased a hundred and more per cent in the light. In diffuse sunlight, growth of yeast in benzoate was also less than in darkness at the same temperature.

Examination of the glass from the fermentation tubes by spectro-photography with a mercury vapor quartz lamp revealed that it was permeable to wave lengths as short as 3000 Angstrom units. By the use of suitable filters in connection with the above experiments it was found that it was the shorter rays of the sun, that is, those which were cut out by amber and brown colored filters which were responsible for the above photosensitizing effect on sodium benzoate. The effect of adding certain fluorescent dyes to benzoate solutions was also studied. Addition of esculin 1:100,000 *decreased* the inhibitory action of sodium benzoate. On the other hand, solutions of eosin, *markedly potentiated* the inhibitory action of sodium benzoate on yeast fermentation. The above experiments were carried out in the bright sunlight on sea shore at Ocean City, Md., during the summer of 1925, and additional experiments with quartz lamp and spectroscope were performed in the laboratory.

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Photopharmacology. VI: Influence of sun's rays on growth of yeast in some fluorescent solutions.

DAVID I. MACHT.

[*From the Pharmacological Laboratory, John Hopkins University, Baltimore, Md.*]

The influence of a number of fluorescein derivatives on the growth of yeast in sunlight and in the dark was studied, in a manner similar to that described in the preceding communication. A 0.5 per cent or 1 per cent suspension of yeast in 5 per cent or 10

per cent of cane sugar was generally employed and the quantity of CO_2 evolved was measured. To such suspensions of yeast in sugar solutions, the following fluorescent compounds were added in concentrations varying from 1:50,000 to 1:250,000.

The sodium salt of fluorescein itself; the potassium salt of tetra-brom-fluorescein (eosin); the potassium salt of di-brom-fluorescein; the sodium salt of tetra-iodo-fluorescein (erythrosin); the potassium salt of tetra-chlor-fluorescein, the chlorine being introduced into the phthalic residue; the potassium salt of a chlorinated fluorescein with the chlorine introduced into the resorcin component; and the potassium salt of sulphone fluorescein. These compounds were prepared at the request of the author by Dr. E. White through the courtesy of the research laboratories of Hynson, Westcott, and Dunning Co.

It was found that in concentrations 1:100,000, none of the dyes produced any appreciable effect in yeast fermentation in the *dark*. In stronger concentrations (1:50,000) eosin produced a slight inhibition. When exposed to direct sunlight, in concentrations of 1:50,000 all of the dyes produced a slight inhibition of the yeast. When however, the same dyes were added to yeast suspensions in direct sunlight together with small quantities of sodium benzoate a remarkable synergistic effect was noted. The inhibitory power of the combinations on the fermentation power of the yeast was potentiated two hundred and even more per cent, as compared with either dye or sodium benzoate alone. Thus solutions of eosin 1:100,000 plus sodium benzoate 1:1000, in direct sunlight produced an inhibition two or three times as great as that produced by either eosin or sodium benzoate alone. Such a potentiation was not noted in the dark.

On comparing the relative potency of the various fluorescein derivatives in combination with sodium benzoate, it was found that eosin or tetra-brom-fluorescein was more effective than tetra-chlor-fluorescein, and the latter more powerful erythrosin. The tetra-brom compound was more powerful than the di-brom-fluorescein. The chlorinated compound with the chlorine in the phthalic residue was more effective than the compound with the chlorine in the resorcin group, and the sodium fluorescein and sulphone fluorescein, were the weakest of all. On comparing the tetra brom with the tetrachlor fluorescein, it was found that whereas in direct sunlight the eosin was more effective, this dye after a few hours was for the most part decolorized, so that after ex-

posure for longer than 4 hours, it became relatively weaker than the chlorinated compound.

By the use of colored filters it was found that the shorter rays of sunlight were the more potent in producing the above photochemical potentiation. The glass of the fermentation tubes was tested with a mercury vapor quartz lamp and spectroscope and was found to transmit waves down to about 3000 Angstrom units. Most of the experiments with sun's rays were performed in the open, on the coast of the Atlantic Ocean at Ocean City, Md., during the summer of 1925.

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Experiments with trypanosomes in relation to the Wassermann reaction.

K. LANDSTEINER and J. van der SCHEER.

[*From the Laboratories of The Rockefeller Institute for Medical Research, New York City.*]

The results of recent work[1] on the possibility of producing anti-bodies by means of substances apparently belonging to the class of lipoids have stimulated renewed investigation on the cause of the production of the Wassermann reagins.

Several main hypotheses relative to this subject have been considered. One of these implies that the reagins are no antibodies at all; others suppose that they are antibodies for spirochetes with an affinity also to lipoids of common origin; still another assumes that antibody formation is brought about by lipoids of the infected organism.

In analogy to the experiments on the production of heterogenetic antibodies by mixtures of proteins and alcoholic extract of organs,[1] Sachs and his coworkers[2] thought of the possibility that the production of antibodies is due to a combined action

[1] Landsteiner, K., and Simms, S., *J. Exp. Med.*, 1923, xxxviii, 127; Landsteiner, K., and van der Scheer, J., *J. Exp. Med.*, 1925, lxi, 427; Landsteiner, K., *Biochem. Z.*, 1921, cxix, 306.

[2] *D. med. Woch.*, 1925, No. 15.