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## The Synthesis of Vitamins by Microorganisms

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condition of the pea broth. The following canned vegetables offer conditions for the growth of the organism and development of the blackened condition: Sweet corn, peas, green and wax beans, carrots, beets, pumpkin, plain baked beans and hominy.

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### SOME OBSERVATIONS ON THE GERMICIDAL EFFICIENCIES OF ALKALIES

MAX LEVINE, J. H. BUCHANAN, GRACE LEASE AND  
E. E. PETERSON

A technique is described for measuring the relative germicidal efficiencies of strong alkalies.

For a given alkali, the germicidal efficiency increases with decreasing  $H^+$  ion concentration, but the  $H^+$  ion concentration is not suitable as an index of the germicidal powers of different alkalies.

The addition of various salts to sodium hydroxide increased the germicidal effects of the alkali.

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### THE SYNTHESIS OF VITAMINS BY MICRO- ORGANISMS

GERTRUDE SUNDERLIN AND C. H. WERKMAN

The synthesis of vitamin B is of general occurrence among microorganisms. Negative results of some investigators may be accounted for by inadequate amounts fed or too limited feeding periods. Our experiments showed the following organisms to elaborate vitamin B when tested by the rat weight test: *Saccharomyces cerevisiae*, *Torula rosea*, *Oospora lactis*, *Bacillus adhaerens*, *Bacterium coli* (three strains), *Bacillus subtilis* and *Bacillus mycoides*.

The amount of organism fed is very important in the determination of vitamin B production by microorganisms. Drying at 37°C. and 100°C. for forty-eight hours did not materially diminish the vitamin potency of the bacterial mass. The three strains of *Bacterium coli* used in our experiments show little variation in their ability to synthesize vitamin B. The vitamin B furnished by intes-

tinal bacteria is of minor significance in affording the vitamin requirements of white rats.

The synthesis of vitamin A did not occur in the following organisms tested: *Rhizobium leguminosarum*, *Azotobacter chroococcum*, *Bacterium coli*, *Oospora lactis* and *Torula rosea*.

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## SOME ERRORS IN THE USE OF PHYSICO-CHEMICAL CONCEPTS IN PHYSIOLOGY OF BACTERIA

R. E. BUCHANAN

Several erroneous concepts as to the application of certain of the so-called laws of physical chemistry to bacteriology are current in the literature pertaining to the physiology of bacteria.

1. The chance distribution of reactivities and opportunities for reaction of molecules constitute the basis for the formulation of the laws of mass action. From these we derive the equations illustrating the progress of monomolecular, bimolecular and other reactions. It is argued that the chance distribution of resistances of microorganisms to lethal agencies justified the expectation that the survivor's curve should conform to the monomolecular reaction curve. The confusion of terms which leads to this fallacious conclusion are noted.

2. In most cases in bacteriological literature the fixity of the principal temperature relationships for each species of organisms is assumed. It is shown that not only rates of growth and death of an organism depend upon physical and chemical environment, but the position of the minimum, the optimum, and maximum growth temperatures as well.

3. There exist more or less confusion with reference to the significance of the so-called "R. G. T." rule in bacteriology. It is pointed out that this is only a special application of the van't Hoff-Arrhenius equation which permits the evaluation of a temperature constant.

4. Attempts have been made in the literature to determine the number of reactants or lethal agents acting upon microorganisms, by determining whether the survivor's curve conformed to that of a monomolecular, bimolecular, trimolecular reaction. The inherent fallacies in this assumption are indicated.

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