greatly benefited. In other words, these forty-three persons, previously in a state of practically continuous coryza, suffered from less than one cold per person during this season.

(4) The oral vaccine makes frequent administration practical, which is so essential in such short life immunities as occur with the bacteria of upper respiratory infections.

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A "GROWTH SUBSTANCE"

IN connection with a survey of the nutritional requirements of pathogenic yeasts and molds being carried on in this laboratory in collaboration with Dr. L. B. Kingery, of the Department of Dermatology, University of Oregon Medical School, we observed the case of an organism isolated from a deep skin lesion, which the authors decided to investigate more fully.

The organism grows with extreme rapidity in a suitable medium, is easily suspended and handled and is reasonably uniform in its responses. Aside from the ordinary nutrients used for yeast culture[1] this organism requires an assortment of amino-acids and is stimulated appreciably both by pantothenic acid and crystalline vitamin B. To promote rapid growth, however, there is required in addition another water-soluble substance which is particularly abundant in liver, liver extract No. 343 (Eli Lilly), kale and alfalfa, and to a lesser but considerable extent in milk. Its effect is striking in the extreme and becomes apparent two or three hours after seeding with the organism.

Since liver and kale, the richest known sources, have remarkable nutritive properties for higher animals, the latter being of extraordinary value for poultry and dairy cows, we suspect that the "growth substance" under consideration is of importance in the nutrition of animals as well as of the organism which we are using as a tool.

This nutrilite has a tendency to be associated with proteins, such as casein and egg albumin, to such an extent that for a considerable period of time we worked upon the supposition that the substance was an unknown amino-acid such as is being investigated by Rose[2] and his co-workers. It was later found, however, that careful purification of casein previous to hydrolysis removes all but traces of the stimulating substance.

Concentration of the "growth factor" has been accomplished to such an extent that one part of the preparation gives a response when added to ten million parts of culture medium. The preliminary steps in the concentration are the same as are used by Kuhn[3] in the preparation of lactoflavin. That our growth factor is not lactoflavin itself is shown by the fact that its physiological effect is practically unimpaired by long exposure to light, whereas under the conditions used the lactoflavin present in the preparation was largely decolorized and destroyed. Also through the kind courtesy of Dr. Kuhn, of the Kaiser-Wilhelm Institut in Heidelberg, we have been furnished a sample of pure crystalline lactoflavin which gives negative results when used as a substitute for our cruder material. We can not be sure, however, that pure lactoflavin is not *one* factor concerned in the response.

It appears that in the later steps of the purification of lactoflavin, material is discarded which is physiologically very active (at least toward certain lower organisms). This interpretation is in line with the recent work of Booher[4] who finds that what may be regarded as a crude lactoflavin preparation is effective for experimental rats, under conditions where Kuhn finds the pure pigment to fail entirely.

Our results would call in question the usefulness of such partially refined lactoflavin preparations as that of Itter, Orent and McCollum,[5] which may or may not owe its physiological action to lactoflavin itself. It should be noted that from 10 pounds of whey powder these workers recovered only what is equivalent to about 700 units of "vitamin G." This can not be more than a one or two per cent. yield on the basis of that present in the original whey powder. This fact in itself indicates that something of outstanding importance has been discarded during the purification.

The nutrilite with which we are concerned is very stable; it is only partially destroyed by long autoclaving at 20 pounds pressure in 3N (or even 5N) H_2SO_4 solution, or in 2N $Ba(OH)_2$ solution. The concentration of this substance is being continued; it seems likely that the microorganism affected may be a valuable tool in helping to clear up the confusion regarding the number and chemical characteristics of the water soluble vitamins which remain as yet unknown.

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[4] Booher, *Jour. Biol. Chem.*, 107: 591, 1934.

[5] Itter, Orent and McCollum, *Jour. Biol. Chem.*, 108: 579, 1935.