

starch-like body inulin and the alcohol mannit come next and the trisaccharide raffinose is least available of all. This order corresponds to the size of the molecule, whereas in the *B. coli* group, the configuration of the molecule is the main thing, the aldehydic sugars being acted upon very readily, and the ketonic sugars less readily. The bacillus of the colon group which can utilize the ketonic disaccharide can almost always utilize the ketonic trisaccharide raffinose as well.

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The comparative resistance of spores and vegetative cells of bacteria towards calcium hypochlorite.

By **C. M. HILLIARD.**

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At least three distinct grades of resistance to the disinfectant action of calcium hypochlorite may be recognized among the bacteria. They are respectively ordinary vegetative cells, acid-fast organisms, having a fatty composition, and the true spore cells. The present study is concerned only with the vegetative cell and the spore. Subsequent work will be done with the tubercle bacillus as representing the acid-fast group.

Pure cultures of *B. coli*, *B. prodigiosus*, *B. subtilis* (spore former) and *B. anthracis* (spore former) were grown in broth for a time sufficient for spores to appear in large numbers in the two latter cultures. A few drops were then transferred to dilution bottles, the initial number present was determined, and the calcium hypochlorite of known strength was added in carefully weighed amount. Agar plates were made at intervals and the reduction determined.

The results of the work to date may be summarized as follows:

1. The sterilizing action of calcium hypochlorite in water is very rapid at first, the maximum reduction being nearly complete in three hours.
2. Of the organisms studied, *B. subtilis* is most resistant, followed by *B. anthracis*, and then by the non-spore formers, *B. coli* and *B. prodigiosus*.
3. At least 1.5 parts of available chlorin to 1,000,000 parts

of water is necessary to get 99 per cent. reduction with a spore former in six hours, while 0.5 part to 1,000,000 is sufficient for this degree of reduction with non-spore formers.

4. Sixteen parts of available chlorin per million of water does not effect complete killing of *B. subtilis*; 1.5 parts brings about complete sterilization with *B. coli* and *B. prodigiosus*.

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Studies on barium feeding.

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Half-grown rats fed for some months on a mixed diet to which BaSO_4 was added remained in good health and did not store up measurable traces of barium in their tissues. However, when instead of a mixed diet one poor in calcium was fed, other conditions being the same, a few milligrams of barium were stored in the tissue of each animal. It is therefore evident that under special conditions even very insoluble substances may be absorbed to some extent.

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The production of grafted and multiple embryos.

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After removing the fertilization membranes of sea urchin eggs (*Arbacea*) and allowing them to develop to the desired stage, the eggs were placed in an alkaline (NaOH) sea water and centrifuged in narrow bore tubes. In this way large numbers of eggs were agglutinated, and developed into double, triple, etc., blastulæ, gastrulæ and plutei. In ten to forty per cent. the eggs and blastomeres were more or less completely fused, forming giant blastulæ, composed of three, four or more eggs.

In the first group parallel development took place, resulting in double, triple, etc., embryos, many of which were subsequently separated by the antagonistic sweep of the cilia. In the second group, the eggs were more intimately united to form a common