IN THE LABORATORY

Methods for Increasing the Value of Hydra as Material in Teaching and Research

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In the course of an investigation in which *Hydra fusca* was used it became necessary to secure known and controllable environmental conditions in which the organism would exhibit normal behavior. This necessitated discarding the usual "pond water" and substituting a known solution as the environmental fluid. During the progress of trials to this end certain observations were made which may prove of use in facilitating classroom culture of, and demonstrations with, this form and also in enhancing its value as experimental material.

Hydra from cultures collected locally or from cultures obtained from Woods Hole, when transferred to a saline solution[1] made with ordinary distilled water from the laboratory supply, went into "depression" (*i.e.* exhibited continuous contraction followed by loss of tentacles, leading often to final disintegration), beginning a few minutes after transfer.

If distilled water of great purity, triple distilled from glass, was used, this did not occur, and the hydra remained normal. Neither did it occur immediately if a small amount of the culture fluid was added to the saline made with the ordinary distilled water. However, the addition of crystalline egg albumin, at the rate of 0.2 cc. of a 3 per cent albumin solution/100 cc. of the saline, was found to give complete protection for several days (3 at least), under survival conditions.

Experiments indicate that the toxic action of the water is probably due to substances such as traces of heavy metals, which are effective in extremely low concentration. Copper was found to be toxic within a few hours when present in a molar concentration of 5×10^{-7}. The action was completely prevented by albumin at 1:50,000, possibly even less. Tests indicate that this protective action is most probably the result of removal of the toxic material by adsorption on, or combination with, the albumin.

Hydra in solutions containing sufficient albumin show very fully stretched bodies with the tentacles extended to their maximum length, giving a display seen only rarely.

While the foregoing treatment will eliminate the need for exceedingly pure water in making cultures or class demonstrations, it was realized that a preparation of crystalline egg albumin is not readily available to all, so a few experiments were tried using filtered egg white. This will serve for classroom use. The amount needed will have to be ascertained by trial and error.

It is not necessary, at least over periods of a few hours, to use a saline solution. Distilled water shaken with a little egg white will serve to maintain the exhibition.

Another demonstration readily made under these conditions is vital staining with methylene blue. It was found that by increasing the concentration of albumin the toxic action of the dye was so reduced that deeply stained specimens showing little, if any, symptoms of damage could be made. For this the albumin concentration should be increased about 5-fold. A solution of the dye of 1:30,000 is tolerated. If, after staining, the hydras are kept for 12 hours in a solution lacking the dye, all the dye will be found in the endoderm, leaving the ectoderm colorless except for the cnidoblasts. These show as minute, dark blue dots.

Hence, by the use of these simple techniques, classroom cultures may be kept more easily, and demonstrations of the phenomenon of depression, recovery therefrom, the beauty of the fully extended animal, and the tissue layers may be easily made in the living state.

The ability to keep hydra in good condition in a known environmental medium will greatly increase its value as research material.

[1] The saline contained KCl, 0.002 gram; NaCl, 0.05 gram; $CaCl_2$, 0.003 gram; and $NaHCO_3$, 0.002 gram/1,000 cc. distilled H_2O.

Electron Micrographs of X-Ray-treated *Escherichia coli* Cells

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Ever since Muller (*14*) produced mutations in *Drosophila* by X-rays, this method has been adopted in the study of mutations in many other organisms, including microorganisms. Beadle's work (*1*) on X-ray mutants of *Neurospora* has not only given us many new ideas of the metabolism of this fungus, but it has also been a contribution to fundamental ideas of genetics. Euler, Ahlstrom, and Hogberg (*5*) X-rayed yeast cells to produce genetic changes, including formation of giant cells.

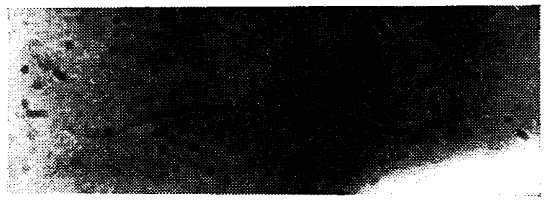

FIG. 1. X-ray-treated *E. coli* cell which has become elongated (ordinary microscope).

The effect of X-rays on bacteria has been studied by a number of investigators since shortly after Roentgen's discovery of the rays. Newcomer (*15*) in 1917 noticed that X-rays had a bactericidal effect on *Eberthella typhosa*. Clark and