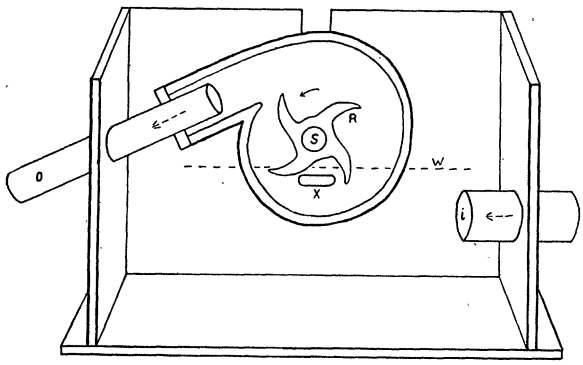

FIG. 1.

draws water. In the figure one side of the chamber and of the pump have been removed to show details. The pump is made with two sides (vertical diameter 1½ to 2 inches), and the peripheral border, slightly greater than ⅛ inch wide, which is bent in warm water to correct shape and cemented in place with a solution of celluloid in acetone. The rotor (R) is cut from a piece of ⅛ inch celluloid and mounted on the shaft of ¼ inch glass tubing with a short length of rubber tubing in between. The openings for the shaft in the sides are considerably larger than the shaft to eliminate friction. The completed pump is simply cemented into the chamber in which slots are left for the two ends of the shaft. The slots extend downward only far enough to leave the shaft clear. In action the pump receives water through the hole (X) in each side and pumps it out through the tube (o) leading directly into the experimental aquarium. A larger tube (i) leads from the aquarium into the pump chamber to permit continuous replenishment of the water. It was generally arranged so that the pump discharged water to the bottom of the experiment tank.

It is only necessary to keep the water level relatively constant so that the pump does not run dry. The pump is so placed with reference to the experiment tank that when not running the water level (W) is slightly above the intake apertures (X). When running the pump discharges water as rapidly as it enters through the apertures, reducing the water level so that both air and water are drawn into the pump. Here the water is violently churned with air by the rotor and the water entering the aquarium is full of small bubbles.

The pump is entirely water-lubricated and the only foreign materials in contact with the water are celluloid, rubber and glass. Neither oil nor metallic ions can enter. Several such pumps may be mounted in series and run by the same motor to aerate and circulate the water in a number of aquaria. Due to the loose bearings there is no indication of wear even after months of almost continuous running.

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SPECIAL ARTICLES

ACTION OF DINITRO COMPOUNDS ON SEA URCHIN EGGS[1]

A STUDY of the effect exerted by 4–6 dinitro-o-cresol (DNC) on the eggs of the sea urchin (*Arbacia Punctulata*) shows that this reagent, at 21° C., in optimum concentrations, stimulates oxygen consumption four hundred per cent. in fertilized and six hundred per cent. in unfertilized eggs, and that it simultaneously suppresses cell division in the fertilized eggs. Potassium cyanide antagonizes the respiratory stimulating action, but supplements the division suppressing action of DNC.

The DNC block to division in fertilized eggs is completely reversible even after three hours exposure to a concentration seven to ten times the optimum for respiration. The eggs, on being returned to sea water, continue cell division from the point of interruption and develop to swimming larvae. That these effects are attributable to the nitro substituted molecule is indicated by the fact that phenol and o-cresol block cell division only in concentrations several thousand times as great as those required for the corresponding dinitro compounds.

The data indicate that the optimum respiratory concentration of DNC is also the concentration which first significantly suppresses cell division. Similar experiments with thirteen other cell penetrating nitro compounds and with the eggs of other invertebrates have shown that the optimum concentrations for respiration are invariably critical concentrations for division. The ability of dinitro compounds to affect respiration and division becomes less as their ability to penetrate the cell decreases.

The data further show that if DNC in optimum respiratory concentration is added more than 20 to 25 minutes before first cleavage is due to occur relatively few eggs divide; if added after this time a normal proportion of eggs proceeds to the two-celled stage, where most of them are arrested in development. A similar critical point has been observed at about the same relative time prior to the second and third cleavages.

A preliminary cytological examination, made by Dr. Henry J. Fry, seems to have established two points regarding eggs in which division has been suppressed by DNC.

(1) Nuclear division does not continue after cytoplasmic division has ceased.

[1] Preliminary note.

(2) About sixty-six per cent. of the eggs are in early prophase (two new asters have arisen; chromosomes are becoming organized; and the nuclear membrane is still intact). In normal, untreated, control eggs, under comparable conditions, only about twenty-five per cent. are in prophase.

There is also some evidence that in these DNC treated eggs, darkly staining chromatin may be recognized somewhat earlier than in normal eggs, that is during the late resting phase instead of early prophase.

These experiments, as well as others on unfertilized eggs and the fertilization process, indicate that so far as suppression of division is concerned, DNC acts on the nucleus rather than on the cytoplasm or plasma membrane, and that this effect may be due to some modification of or interference with an oxidative process occurring in the late resting phase or early prophase. Further experiments are being conducted to determine the mode of action of the dinitrophenols and their reduction products.

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POSITIVE INFECTION TRIALS WITH ELM "WILT" FUNGI

FOLLOWING the isolation of a variety of fungi from diseased American elms in Illinois, as reported by Harris[1] in 1932, a considerable series of inoculation tests has been carried out and success in reproducing infection has been obtained with 3 of the fungi considered by Harris as most important, namely, two strains of Coniothyrium, designated as "A" and "B," and Phoma "B." It now appears advisable to announce the results of some of these tests.

Each of four three-year-old elm seedlings were inoculated with Coniothyrium "A" in the laboratory on April 6, 1934. A sliver of elm wood, previously sterilized and then well inoculated with a pure culture of the fungus, was inserted through a T-shaped slit in the bark so as to lie in contact with the xylem of the seedling. A glass tube, containing moist cotton at the base, was fitted on the inoculated branch and held in place by perforated corks, in order to surround the inoculation with a moist atmosphere, and the cotton was kept moist during the first few weeks. Pycnidia of the Coniothyrium soon formed on the exposed xylem in the T-shaped slits of all four of the seedlings as well as on the wood slivers used as carriers of inoculum. By the middle of July the inoculated lateral branch of one seedling had shown a slowly progressing but definite "wilt" and, three weeks later, was dead from the tip down to 9 cm below the point of inoculation. Cultural platings from this seedling yielded the Coniothyrium "A," with which it had been inoculated, as far as 20 cm below the point of inoculation and 11 cm below any external evidence of infection.

In another test a positive result was obtained with Coniothyrium "B." Two three-year-old seedlings were inoculated on January 4, 1934, in the following manner. The bark was scraped off one side of the stem for a vertical distance of 1 cm, exposing the xylem. Corn-meal agar containing actively growing mycelium of the fungus was placed in contact with the xylem and covered by a layer of moist cotton. This was enclosed by Cellophane held in place by adhesive plaster. Of these seedlings, one showed symptoms of a general infection by the end of March, and cultural isolations were made from it on April 10. Coniothyrium "B" was obtained from points as far as 15 cm above and 12 cm below the point of inoculation.

Phoma "B," the third agent used, was found to be capable of infecting elm leaves within a very short time. Drops of a spore suspension were placed upon living, detached leaves suspended in a petri dish with the open end of the petiole immersed in water, in modification of the method described by Clinton and McCormick.[2] Development of mature pycnidia took place in the mesophyll within five days. A more abundant infection took place when spores were planted on the upper leaf surface, in spite of the fact that stomates are much more numerous on the lower surface. While these experiments with the Phoma do not furnish conclusive proof of the ability of that fungus to infect a healthy elm tree, they suggest the means by which it gains entrance to the trees from which it is isolated in culture.

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AN ANTIRACHITIC DERIVATIVE OF CHOLESTEROL[1]

RECENTLY Koch, Koch and Ragins[2] reported that provitamin D is not limited to ergosterol but can be formed from cholesterol. In this laboratory an antirachitic substance produced from cholesterol but different from vitamin D has now been isolated in pure form and known constitution through an investigation of the chemistry of the Bills[3] method for the

[1] Hubert A. Harris, "Initial Studies of American Elm Diseases in Illinois," *Ill. St. Nat. Hist. Surv. Bull.* 20(1): 1–70, 1932.

[2] G. P. Clinton and Florence A. McCormick, "Rust Infection of Leaves in Petri Dishes," *Conn. Agr. Exp. Sta. Bull.* 260: 475–501, 1924.

[1] Journal paper No. J182 of the Iowa Agricultural Experiment Station, Ames, Iowa. Project No. 103.

[2] F. C. Koch, E. M. Koch and I. K. Ragins, *Jour. Biol. Chem.*, 85: 141, 1929.

[3] C. E. Bills, *Jour. Biol. Chem.*, 67: 753, 1926; C. E.