back into water, where it has to find and enter the skin of man, within a few days, or else perish. In human blood vessels the minute worms mature in some two months and give off their eggs. This parasite has to alternate from snail to man (from the creation onward) or else perish.

The complete destruction of either host would exterminate the parasite! Man prefers to exterminate the snails. That this is feasible was inferred from the facts that these snail hosts are not very numerous nor difficult to locate. There are here only two kinds of water snails that carry the parasite, and each carries but one of the two species of parasites which both live in man, with different preferences, the one infesting the intestines, the other the urinary organs.

Mozley's report is a thoroughly scientific record of three years of strenuous work (1939–42) during which some thousands of different localities were examined and a laboratory established for examination of, and experiments upon, the different snails.

In some localities 90 per cent. of the natives were infected and throughout the country 35 per cent. of natives and 8 per cent. of Europeans suffered from the worser form of the disease. All races of men and all members of society, both poor and well-to-do, were afflicted. Before the advent of civilized man perhaps the disease was held in check by ducks and fish that destroy the snails, but of late the disease is alarmingly increasing, and this seems due to the "White Man's Civilization." For while the snail that causes intestinal bilharzia (*Biomphalaria pfeifferi* (Krs.)) as being the host of *Schistosoma mansoni* may be found in clean, flowing waters, the worser snail (*Physopsis globosa* (Krs.)) as harboring the parasite *Schistosoma haematobium* is to be found in dirty water, contaminated or polluted.

The native habits of drinking from, and of bathing in, all sorts of pools was bad enough, but the European has increased the dangers by careless disposal of wastage and rubbish so that many places abound in trash and dejecta that aid the disease-bearing snails.

Strangely, man's great aid in civilization, the railroad, is strongly to be condemned as favoring the bad snails by giving them shelter through the making of fills, dams, culverts and bridges over waters into which human dejecta are allowed to fall.

The book gives in detail recommendations for coping with all aspects of the bilharzia problem except that left to the physician—the dosing of human patients. When these suggestions shall be carried out the bilharzia of Southern Rhodesia should diminish and not increase, even dwindle to the vanishing point.

Many experiments showed the ease with which the young parasite, called cercaria stage, that leaves the snail can be killed, but either the water is more or less injured or else the materials used are expensive.

The snails themselves are known to be easily killed by some salts of copper, but many of these are expensive. There were also found native plants whose bark, leaves or seed or pods were deadly to snails. Finally a number of good methods were selected for killing the snails without danger to the natives. To solicit the aid of the natives posters are distributed advising them to use these, to them well-known, plants or else "the medicine of the Government," which medicine "kills the snails within two days, but does not hurt a human being." "The Government's doctor has often drunk water into which this medicine has been put, and it has not done" him any harm. This "medicine," containing copper carbonate, is a cheaply obtained mineral, Malachite, which Mozley recommends as one of the most useful means of killing those snails in Southern Rhodesia. Details of its preparation and modes of distribution with many other practical suggestions are given for those who may make use of this most useful work which though needed most by the government of that part of the world has a meaning for all who have to do with the West Indies, Portugal or any part of the world south of these regions, all subject to bilharzia.

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SPECIAL ARTICLES

AN ANTIBIOTIC SUBSTANCE ACTIVE AGAINST MYCOBACTERIUM TUBERCULOSIS

RECENTLY Soltys[1] reported that culture filtrates of a strain of *Aspergillus fumigatus* showed antibiotic activity against *M. tuberculosis*. As far as we know, no isolation of a substance in a pure or even a crude form active against tubercle bacilli has yet been described.

[1] M. A. Soltys, *Nature*, 154: 550, 1944.

[2] A. Vaudremer, *C. R. Soc. Biol.*, 73: 51, 1912; 74: 278 and 752, 1913.

The strain of *A. fumigatus* investigated was isolated in this laboratory as a contamination. Grown at room temperature on Czapek-Dox medium containing 2 per cent. corn syrup, it produced substances active against gram-positive cocci, gram-negative bacilli and some acid-fast bacilli. The test organisms employed were *Staph. aureus* H, a *B. coli* and *M. tuberculosis* BCG17. After 15 to 18 days of growth the medium was, on the average, active against staphylococci in a 1:40 dilution. Activity against *B. coli*

varied independently and was never higher than 1:20. We have reasons to believe that the activity against gram-positive and gram-negative organisms is due to two different substances which might be separated by their selective solubility in organic solvents. The substance active against staphylococci is also active against *M. tuberculosis* BCG. The anti-coli substance is less stable and has not yet been investigated for activity against BCG.

Both substances can be obtained in crude form from the medium, (1) by extraction with chloroform, either directly or after preliminary concentration of the medium; (2) by adsorption onto Norit and subsequent elution with chloroform and (3) by saturation with ammonium sulfate and extraction of the precipitate with chloroform. Chloroform extracts (1) and (3) can be partially decolorized by treatment with Norit with hardly any loss of activity. The active substance seems to be dialysable through Cellophane membranes.

Probably identical substances can also be extracted from the mold itself by alcohol, acetone, chloroform or ether, supporting Vaudremer's[2] observation made with press juice of the same mold.

At present our efforts are directed mainly towards the final purification of the active substance, as the work with crude products has only presumptive value.

The activity of the partially purified preparations was established by the following methods: (1) for staphylococci and *B. coli:* (a) by serial dilutions in papain broth[3]; (b) by a new method, using the permeability of soft agar for testing growth inhibitory substances, the particulars of which will be published separately. (2) For acid-fast organisms by two methods: (a) bacteriostatic action was investigated by making serial dilutions of the substance in Kirchner's[4] medium and inoculating the tubes with a suspension of BCG. Preliminary readings were taken after 5 to 10 days and final examinations for growth were made after 6 weeks; (b) bactericidal action was estimated by incubating a heavy suspension of BCG with different dilutions of the substance for 24 hours and subsequently inoculating Petragnani slants with 0.1 ml of the mixture. Results were read after 6 weeks.

Our experiments with the crude preparations seem to indicate that: (1) they possess a high degree of activity against staphylococci, preventing their growth in 1:700,000 of the dry crude substance; (2) their bacteriostatic activity against BCG appears to be higher, preventing growth in at least 1:1,400,000 dilution; (3) their bactericidal action against BCG is equal to or slightly lower than their anti-staphylococci activity.

[3] I. N. Asheshov, *Can. Publ. Health Jour.*, 32: 468, 1941.

[4] O. Kirchner, *Zbl. f. Bakt.*, I Orig., 124: 403, 1932.

Often a BCG emulsion treated with a 1:500,000 dilution of the active substance produced no growth on Petragnani slants, but occasionally isolated colonies appeared on slants inoculated with lower dilutions. We attribute this phenomenon to imperfect emulsion of the BCG culture, resulting in lumps which protect the bacterial cells from the action of the antibiotic.

No bactericidal action on avian type of *M. tuberculosis* was observed even in dilutions as low as 1:100.

The active substance is poorly soluble in water: the activity of aqueous extracts of the dry substance against staphylococci and BCG never exceeded 1:40,000.

We consider animal experiments on toxicity and activity of the crude substance valueless and are postponing them until preparations of a greater purity are obtained.

The active substance investigated may be similar to fumigacin or helvolic acid (Waksman;[5] Chain *et al.*[6]), though some of its properties seem to indicate that the two antibiotics are not identical.

Some other, as yet unidentified, molds were found to produce active substances against tubercle bacilli and are now under investigation.

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A QUANTITATIVE STUDY OF THE FIBRINOLYSIN-ANTIFIBRINOLYSIN REACTION[1]

THE antifibrinolysin test devised by Tillett and Garner[2] is based upon the observation that Group A hemolytic streptococci produce a substance, fibrinolysin, which dissolves the plasma clot of normal individuals, whereas the plasma clot of individuals convalescent from hemolytic streptococcal infections is generally resistant to lysis. This resistance is attributed to the presence in the blood of specific antibody, antifibrinolysin.

In 1938, Milstone[3] reported that the process of streptococcal fibrinolysis required the presence of an accessory lytic factor normally present in human

[5] S. A. Waksman, SCIENCE, 99: 220, 1944.

[6] E. Chain *et al.*, *Brit. Jour. Exp. Path.*, 24: 108, 1943.

[1] This investigation was supported through the Commission on Acute Respiratory Diseases, Board for the Investigation and Control of Influenza and Other Epidemic Diseases in the Army, Preventive Medicine Service, Office of The Surgeon General, United States Army, and by grants from the Commonwealth Fund, the W. K. Kellogg Foundation, the John and Mary R. Markle Foundation and the International Health Division of the Rockefeller Foundation to the Board for the Investigation and Control of Influenza and Other Epidemic Diseases for the Commission on Acute Respiratory Diseases.

[2] W. S. Tillett and R. L. Garner, *Jour. Exp. Med.*, 58: 485, 1933.

[3] H. Milstone, *Jour. Immun.*, 42: 109, 1941.