

A SUGGESTED REPELLENT FOR SCHISTOSOME CERCARIAE

By W. R. G. ATKINS, O.B.E., F.R.S., *Late Captain R.A.M.C.*

Attack by the cercariae of *Schistosoma haematobium*, *S. mansoni* and *S. japonicum* causes in man debilitating diseases which in certain countries are widespread. Infection is mainly through the skin, though it can occur through drinking water containing the parasites. It has been shown by Sproule (1939) that freshly liberated vigorous cercariae of *S. haematobium* and *S. mansoni* are killed in 30 min. by superchlorination to the extent of one dose beyond that indicated in the Horrocks test. This of course does not deal with skin infection, and though bathing in fresh water may be avoided and water drawn off may possibly be stored till all cercariae are dead, yet it is obviously impossible entirely to avoid contact with natural waters. In U.S.A. and Canada dermatitis is caused at many otherwise desirable lacustrine bathing beaches by cercariae liberated from *Stagnicola emarginata* and other snails which live in shallow water on sandy bottoms (Cort, 1928; Brackett, 1941). The final hosts are apparently water birds and in man these cercariae tunnel in the epithelial layer of the skin and soon disintegrate. No dangerous disease is caused, but there is much discomfort, especially among children who naturally keep to the shallow water. Penetration takes place largely as the water film dries and oiling the skin is no preventive. McMullen (1941) has given an account of attempts to eliminate the parasites by poisoning the snail hosts with copper sulphate or a sulphate carbonate mixture. A temporary success can be achieved at considerable cost.

It is now suggested that as repellents are used for malarial mosquitoes, so also a repellent may have a limited usefulness in dealing with cercariae. It might thus be possible to protect engineers engaged in building bridges or dredging and the arms of fishermen and others who cannot avoid wetting. Furthermore, tests could with advantage be made on the Michigan beaches, where only an indisposition results from infection, and these should give at least an indication of the measure of success to be expected in coping with the forms which cause serious disease.

Experience in the preservation of ropes and nets

(Atkins & Purser, 1936) has shown the effectiveness of copper soaps against bacterial action and fouling. The calcareous tube forming worm, *Hydroides norvegica*, is completely killed over the whole extent of a dockyard basin wall, covered by it to a depth of 2-3 in., when copper sulphate is dissolved in the water of the basin to produce a concentration of one part per million of copper. The reports of the Corrosion Sub-committee of the Institute of Iron and Steel have shown that to many such organisms copper is somewhat more poisonous than mercury and that effective antifouling properties are maintained by a paint which liberates 0.1 g. of copper per sq.m. per day.

It is suggested therefore that the repellent action of copper soaps is worth a trial, particularly the greasy copper oleate, alone or mixed with the rather firmer copper stearate or palmitate.* It seems probable that quite low concentrations could be used, of the order of 1-5%, the diluent being mineral jelly or crude lanoline or a mixture. In rope and net preservation 10% solutions in naphtha or petroleum solvents are used, working in the open air to avoid the fumes. But no evidence can be found that any trouble has arisen here from the contact of even these fat-removing solvents containing copper soaps which get on the hands, arms and to some degree on the face. Occasional contact with minor cuts caused no trouble.

I am indebted to Prof. E. B. Verney, F.R.S., for information as to the toxicology of copper and references to Heffter (1934), and Flury & Zangger (1928). From these it appears very unlikely that any toxic amount of copper would be absorbed through the skin were the latter to be smeared with a copper soap repellent for some hours. Copper oleate, 12.5% in yellow soft paraffin is the Ung. cupri oleatis of the B.P. Codex 1934. Were the time of use prolonged and the skin area large it might be wise to test the urine for copper with sodium diethyldithiocarbamate.

* The more soluble copper naphthenate has an unpleasant smell, probably due to an impurity in the naphthenic acid. Though an excellent preservative its use as a repellent is therefore unlikely to be popular.

REFERENCES

- ATKINS, W. R. G. & PURSER, J. (1936). *J. Mar. Biol. Ass. U.K.* **20** (3), 643-54.
- BRACKETT, S. (1941). *Symposium on Hydrobiology*, pp. 360-78. Madison, Wisconsin.
- CORT, W. W. (1928). *J. Amer. Med. Ass.* **90**, 1027-29.
- FLURY, F. & ZANGGER, H. (1928). *Lehrb. Toxicologie*. Berlin.
- HEFFTER, A. (1934). *Handb. exp. Pharmakol.* **3**, 1928. Berlin.
- McMULLEN, D. B. (1941). *Symposium on Hydrobiol.* pp. 379-88. Madison, Wisconsin.
- SROULE, J. C. (1939). *J. R. Army Med. Cps.* **72**, (6), 384-88.

(MS. received for publication 24. III. 47.—Ed.)