medium at intervals it is possible to prolong the life of the schistosomes for 2-3 months. In one experiment in which the medium (in this case rabbit serum) was renewed at intervals of 1-2 weeks 2 schistosomes lived for 82 days.

It was also found that not more than 4 or 5 worms should be placed in each flask. Overcrowding shortens the duration of life of the parasites as shown by the experiment recorded in Table II.

TABLE II.
The Effects of Overcrowding. The Worms Were All Mature Males Uniform in Size. Plain Ascitic Fluid Was the Medium Used. No Change of Medium.

No. of flasks	No. of worms in each flask	Aver. duration of life in days
3	3	16
3	6	13
3	9	11
3	12	10
1	30	8

Summary. A simple technique is described for maintaining the life of adult schistosomes *in vitro* over a period of several weeks which, with frequent changes of medium, may be extended to 2½ months. This is made possible by the use of small tissue culture flasks, which prevent bacterial contamination and desiccation of the media. The latter may be either horse, sheep or rabbit sera or human ascitic fluid.

8107 C

Action of Various Organic Antimony Compounds on Schistosoma Japonicum in Vitro.

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By using the technique described by Lee and Chu[1] studies were made of the lethal action of the following 4 antimony compounds on adult *Schistosoma japonicum in vitro.*

Trivalent Antimony Compounds

Sodium antimonyl tartrate; chemically pure, supplied by E. Merck, Germany.

Fouadin. This is a 6.3% solution of a colorless powder, antimony III-pyrocatechin-disulphonate of sodium, supplied by Bayer and Company, Leverkusen, Germany.

[1] Lee, C. U., and Chu, H. J., in press.

Pentavalent Antimony Compounds

Urea-stibamine. A slightly pinkish chalky powder, the principal constituents of which are, according to Gray and Trevan,[2] a substance corresponding in composition to the di-substituted urea, symdiphenyl-carbamide-4:4′-distibinic acid, and antimonic acid; supplied by Brahmachari Research Institute of Calcutta, India.

Neostibosan. A yellow powder, p-amino-phenyl stibinate of diethylamine, supplied by Bayer and Company, Leverkusen, Germany.

In all experiments an exact amount of 0.05 cc. of the drug to be tested in various dilutions was introduced by means of a tuberculin syringe into each flask containing 3 or 4 schistosomes in 2 cc. of medium. For purposes of comparison with fouadin, which comes from the manufacturers in a 6.3% solution of the powdered drug, urea-stibamine and neostibosan were also made up in 6.3% solutions from which dilutions were made.

The results of the experiments are presented in Tables I and II.

TABLE I.

Lethal Action of Sodium Antimonyl Tartrate on *Schistosoma Japonicum in Vitro.*

Dilution	Mg. of sod. ant. tart. in 2 cc.	Sheep serum	Ascitic fluid
1 to 10,000	0.2	30 min.	30 min.
20,000	0.1	35 "	34 "
40,000	0.05	1 hr.	59 "
80,000	0.025	5 " 45 min.	1 hr. 25 "
100,000	0.02	10 " 30 "	1 " 35 "
200,000	0.01	—	19 " 8 "
400,000	0.005	—	21 " 8 "
800,000	0.0025	—	44 " 45 "
1,600,000	0.0013	—	4½ days
Control		13 days	15 "

The results of these experiments show clearly that the trivalent antimony compounds are more potent in their lethal action on the schistosomes than the pentavalent compounds and that sodium antimonyl tartrate is the most and neostibosan the least potent of all. This agrees with the prevalent belief that trivalent antimony compounds are more effective in the treatment of schistosomiasis than the pentavalent salts and with our own clinical experience that permanent cure of *Schistosomiasis japonica* results more readily with tartar emetic than with fouadin.

If the average weight of a Chinese patient suffering from schistosomiasis is taken to be 50 kg., the weight of his blood will be 3846 gm., a thirteenth part of his body weight, and the actual vol-

[2] Gray, W. H., and Trevan, J. W., *J. Roy. Soc. Trop. Med. and Hyg.*, 1931, **25**, 147.

TABLE II.

Lethal Action of Fouadin, Urea-stibamine, and Neostibosan on *Schistosoma Japonicum in Vitro.*

Dilution of 6.3% solution of antimony compound	Mg. of antimony compound in 2 cc.	Fouadin		Urea-stibamine		Neo-stibosan	
		Sheep serum	Ascitic fluid	Sheep serum	Ascitic fluid	Sheep serum	Ascitic fluid
1 to 400	0.315	3 hr.	2 hr. 50 min.	15 hr.	3 hr. 15 min.	8 days	5½ days
600	0.210	3 " 37 min.	4 " 12 "	28½ "	15 " 10 "	8 "	19 "
800	0.157	8 " 21 "	4 " 26 "	31 "	16 " 20 "	4 "	Culture infected
1,000	0.126	9 "	4 " 30 "	31 "	17 " 10 "	8 "	4 days
2,000	0.063	12 " 36 min.	5 " 30 "	54 "	42 "	9 "	20 "
4,000	0.032	25 " 50 "	—	—	—	—	—
8,000	0.016	25 "	—	—	—	—	—
16,000	0.008	56 " 15 min.	—	—	—	—	—
32,000	0.004	67 "	—	—	—	—	—
64,000	0.002	111 "	—	—	—	—	—
Control		13 days	27 days	13 days		17 days	

ume, 3663 cc., the specific gravity of blood being 1.050. In introducing intravenously 0.1 gm. of sodium antimonyl tartrate, a safe largest single dose, one obtains a concentration of one in 36,630. Since the cellular elements of the blood occupy at least one-third of the blood volume and there is no reason to believe that the blood cells take up any of the drug, the concentration of sodium antimonyl tartrate in the plasma is actually much higher than 1 in 36,630. *In vitro* even such a concentration of sodium antimonyl tartrate would kill the schistosomes in less than one hour. This, however, does not necessarily argue a direct action *in vivo* as it is well known that antimony compounds introduced intravenously leave the blood stream in a matter of a few minutes.[3] Thus one may not draw any conclusion from these *in vitro* experiments as to the nature of the anti-schistosomal action of antimony compounds *in vivo*.

Summary. The lethal action of sodium antimonyl Tartrate, Fouadin, Urea-stibamine and Neostibosan on *Schistosoma japonicum* is studied *in vitro* and the results support the prevalent belief that the trivalent antimony compounds are more effective in the treatment of schistosomiasis than pentavalent salts and our own clinical experience that permanent cure of *Schistosomiasis japonica* results more readily with tartar emetic than with fouadin.

8108 C

Liquefication of Rabbit Fibrin-Clots by Concentrated Streptococcus Fibrinolysin.

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From the observations of Tillett and Garner[1] and Madison,[2] the fibrinolysin from human strains of *Streptococcus hemolyticus* seems to act specifically on human plasma or fibrin-clots. Although Tillett and Garner have noted exceptional instances of slow dissolution of rabbit fibrin clots by culture of *Streptococcus hemolyticus,* the

[3] Willaud, H., and Behrens, B., *Handbuch der Experimentellen Pharmakologie,* Berlin, 1927, **3**, Part I, 533.

[1] Tillett, W. S., and Garner, R. L., *J. Exp. Med.*, 1933, **58**, 485.

[2] Madison, R. R., PROC. SOC. EXP. BIOL. AND MED., 1935, **32**, 641.