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A New Agent for Objective Measurement of Circulation Time.

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The arm-to-head circulation time may be objectively measured by the injection of 1 cc of aminophylline (0.24 mg) into the antecubital veins. The end-point of the reaction is signalled most frequently by a marked increase in the depth of inspiration, which in many cases amounts to a gasp. While this occurs in every case, in some instances it may be preceded by swallowing movements, a change in facial expression resulting from subjective sensations, or a sharp catch during expiration. The first observable change is taken as the end-point.

The test was tried in 92 patients at various stages in the postoperative state whose ages ranged from 12 to 82 years. Only once in 92 trials was any difficulty experienced in recognizing the end-point. The circulation times ranged from 7.1 to 20.4 seconds averaging 12.4 seconds.

The test is safe, the end-point is sharp, the method is objective, the amount injected is small, the agent is readily accessible. All of these factors combine to commend it.

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Studies on the Microcataphoresis of Animal Parasites.

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Extensive studies have been made on the electric charge of bacteria and suspensions of most of viruses which have been found to carry a negative charge. The amount of the current as measured in milliamperes is primarily responsible for the accumulation and destruction of these microorganisms at the positive pole. With viruses it has been found that the nature of the charge influences passage through a filter, so that this characteristic has been utilized to free these filter passers from contaminating material. Moreover, the knowledge of the charge of the organism is important in devising methods for its destruction *in vivo* and *in vitro*.

Description of Apparatus. In principle and in many structural respects the cataphoresis cell constructed was essentially like the original one devised by Brown and Broom.[1] We merely superimposed a bored-glass section communicating with the channel and a brass plate with appropriate apertures into which the chamber holding the zinc sulphate solution and microorganism suspension could be cemented.

Materials employed. Trypanosoma cruzi, Leishmania brasiliensis and *Leishmania tropica* were grown on Senekjie's medium.[2] The cysts and eggs of intestinal parasites were concentrated by the zinc sulphate technic of Faust *et al.*[3] The filariform larvae of

[1] Brown, H. C., and Broom, J. C., *Brit. J. Exp. Path.*, 1929, **10**, 61.

[2] Senekjie, H. A., *Trans. Roy. Soc. Trop. Med. and Hyg.*, 1939, **33**, 267.

[3] Faust, E. C., Sawitz, W., Tobie, J., Odom, V., Peres, C., and Lincicome, D. R., *Parasitol.*, 1939, **25**, 241.

Strongyloides were cultured from the feces of a chimpanzee, the larvae of *Trichinella spiralis* were hatched in artificial gastric juice, and *E. histolytica trophozoites* were grown on egg-liver extract medium.

Five *T. cruzi* strains were tested. When current A (*i.e.* 90 volts and 7 milliamperes) was applied to culture trypanosomes in the cell, there was immediate increased motility with a drift towards the positive pole, a tendency to clumping which settled to the bottom of the chamber. Motility steadily diminished, ceased in 8 minutes and the organisms disintegrated in 10 minutes. The armadillo strain was more resistant. When an arthropod strain was treated with 0.3% formalin for 24 hours distintegration was incomplete in one hour. When grown on leishmania medium containing 2% lithium chloride to produce rough forms, complete disintegration took place in 17 minutes. Trypanosomes from the rectum of *Triatoma infestans* survived about 30 minutes and disintegrated very slowly. *L. brasiliensis* and *L. tropica* differed very little from *T. curzi* except that they were more sensitive and death and disintegration took place in 8 minutes.

With current A, *E. histolytica* trophozoites migrated to the positive pole. In 15 seconds they became actively motile, ceased moving in 45 seconds and exploded in 3 minutes, leaving no trace. The rounded precystic forms from cultures were similarly charged, but remained nonmotile, showed hyalinization and disintegrated in 2 hours. Concentrates of the cysts of *Giardia lamblia, Endolimax nana, Chilomastix mesnili, E. coli* and *E. histolytica* were resuspended in normal saline and zinc sulphate solution of sp gr 1.18, and were tested with current A. All were negatively charged, showed slow hyalinization, and even after 3 hours a considerable number remained intact and apparently viable. There was no excystation. With current B (*i.e.* 350 volts and a constant but unknown milliamperage) hyalinization took place sooner.

The eggs of *Ascaris lumbricoides, Trichocephalus trichiurus* and *Ancylostoma caninum* were concentrated and floated in zinc sulphate solution. With current A no changes were observed, but with current B they drifted to the positive pole. *T. trichiurus* eggs showed no changes but the other two showed hyalinization and shrinkage of the embryos. Oocysts of *Isospora canis* remained unchanged with current A, but with current B they drifted to the positive pole, and the enclosed spores showed shrinkage in 2 hours.

Filariform larvae of *Strongyloides* suspended in normal saline became actively motile and migrated to the positive pole. Motility progressively diminished and eventually all motion ceased, hyaline changes took place in 45 minutes, the worms clumped in masses and death took place in 2 hours. The free-living adult females showed the same active motility, but hyaline changes took place in 10 minutes. The uterus was contracted and the eggs were seen to be extruded from the uterine pore. All the eggs showed hyaline changes. All motility ceased in 45 minutes. With current B the larvae manifested marked contractions and were killed in a few minutes, but they drifted to the positive pole.

Larvae of *T. spiralis* suspended in normal saline coiled and uncoiled, manifested active movements and drifted to the positive pole. Motility progressively diminished, all movements ceased in 20 minutes and finally they coiled up. When the current was broken, they slowly uncoiled and again developed motility. All motility ceased in 2½ hours and the worms relaxed. With current B there was active motility, but the worms died in 15 minutes in a relaxed position.

Conclusion. T. cruzi, L. brasiliensis, L. tropica, E. histolytica, E. coli, G. lamblia, E. nana, C. mesnili, I canis, A. lumbricoides, T. trichiurus, A. caninum, T. spiralis and *Strongyloides* are all negatively charged. Since bacteria and *E. histolytica* are both negatively charged, it is not possible to purify cultures of the latter by electrolytic methods.