into contact with the atrial muscle auricular fibrillation resulted. This fibrillation lasted from 11 to 12 minutes and could be reproduced with about the same duration.

In 5 dogs we have found that procaine in doses of 10 to 20 mg per kilo intravenously stopped fibrillation produced by the minimal effective faradic stimulation of the atria, but this resistance to fibrillation passed off rapidly, often within 5 minutes. Larger doses, 40 to 80 mg per kilo, prevented even maximal faradic stimulation from producing auricular fibrillation. In 4 dogs auricular fibrillation induced by dropping 5 drops of 1:500 solution of acetyl beta methyl choline chloride solution on to the atria was stopped within 35 seconds by the intravenous injection of 1 to 6 mg of procaine per kilo. The effect of the smaller doses of procaine was very transitory because the application of the same stimulus 5 minutes after cessation of the fibrillation usually caused the fibrillation to reappear.

At least 2 other local anesthetics seem to exert similar effects in inhibiting auricular fibrillation. In 3 dogs p-butyl amino-benzoyl-dimethyl amino-ethanol hydrochloride (pontocaine hydrochloride) in doses of from 0.7 to 12 mg per kg stopped auricular fibrillation produced by the minimal effective faradic stimuli, and in 2 dogs we obtained the same effect with 2-butyloxyquinoline carboxylic acid-4-diethylethylene diamide hydrochloride (nupercaine hydrochloride) in doses of from 1 to 3.75 mg per kg respectively.

*Summary.* At least three local anesthetics, procaine, pontocaine and nupercaine can inhibit experimental auricular fibrillation in dogs.

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## Toxicity of Antiseptics for the Chick Embryo.*

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The resistance of the chick embryo to toxic substances is a subject which has been little explored[1] in spite of the fact that the embryo is well adapted to a variety of bacteriological and physiological experiments. The developing egg consists of rapidly growing em-

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1 Witlin, Bernard, PROC. SOC. EXP. BIOL. AND MED., 1942, **49**, 27.

TABLE I.
Lethal Effect of Injection of 0.05 cc of Antiseptic Agents into Incubated Eggs, Experiments on Five Eggs in Each Lot.

| Agent tested | Conc. | Death in each lot in 6 days | | | Mortality |
|---|---|---|---|---|---|
| Phenol | 5.0% | 4 | 2 | 4 | 10/15 |
| | 2.5% | 2 | 1 | 1 | 4/15 |
| | 0.1% | 0 | 0 | 0 | 0/15 |
| Bichloride of Mercury | 1:500 | 5 | 2 | 4 | 11/15 |
| | 1:1000 | 2 | 2 | 0 | 4/15 |
| | 1:10,000 | 1 | 0 | 0 | 1/15 |
| Tincture of Iodine | 25% | 5 | 3 | 4 | 12/15 |
| | 1.0% | 2 | 1 | 3 | 6/15 |
| | 0.1% | 3 | 1 | 2 | 6/15 |
| | 0.01% | 0 | 1 | 0 | 1/15 |
| Copper Sulphate | 5.0% | 5 | 4 | 3 | 12/15 |
| | 0.1% | 1 | 2 | 1 | 4/15 |
| | 0.01% | 1 | 1 | 0 | 2/15 |
| Potassium Permanganate | 1:1000 | 0 | 2 | 1 | 3/15 |
| | 1:10,000 | 0 | 1 | 1 | 2/15 |
| Ethyl Alcohol | 25% | 1 | 1 | 0 | 2/15 |
| Propylene Glycol | 100% | 0 | 0 | 0 | 0/15 |
| Boric Acid | 4.0% | 0 | 0 | 1 | 1/15 |
| Boric Acid 2.5% in 25% Alcohol | | 0 | 0 | 0 | 0/15 |
| Mild Silver Protein | 10% | 5 | 5 | 5 | 15/15 |
| | 5.0% | 4 | 5 | 5 | 14/15 |
| | 1.0% | 3 | 5 | 2 | 10/15 |
| | 0.1% | 1 | 0 | 1 | 2/14 |
| Liquor Antisepticus, N. F. VI | * | 0 | 0 | 1 | 1/15 |
| Listerine | * | 1 | 0 | 1 | 2/15 |
| Merthiolate | 1:500 | 3 | 3 | 2 | 8/14 |
| | 1:1000 | 2 | 0 | 2 | 4/15 |
| | 1:10,000 | 0 | 2 | 0 | 2/15 |
| Metaphen | 1:500 | 4 | 4 | 2 | 10/15 |
| | 1:1000 | 2 | 1 | 0 | 3/15 |
| Tincture of Metaphen | * | 5 | 5 | 5 | 15/15 |
| | 1:10 | 3 | 2 | 3 | 8/14 |
| | 1:50 | 1 | 1 | 1 | 3/15 |
| Mercurochrome | 2.0% | 3 | 3 | 4 | 10/15 |
| | 1.0% | 1 | 1 | 2 | 4/15 |
| | 0.2% | 0 | 1 | 0 | 1/14 |
| Lysol | 5.0% | 0 | 1 | 1 | 2/15 |
| Pot. Mercuric Iodide | 1:5000 | 1 | 1 | 1 | 3/15 |

*Undiluted.

TABLE II.
Comparison Between Minimal Lethal Dose for Man and Chick Embryo.

| Agent | Man g/kg body wt according to | | Chick embryo g/kg total egg wt |
|---|---|---|---|
| | McNally[2] | Solis-Cohen, etc.[3] | |
| Phenol | .014 | .07 | .05 |
| Bichloride of mercury | .001 | .002 | .002 |
| Iodine | .004 | .019 | .018 |

bryonic tissue in a perfect nutritional environment. It comes sealed in an ampule, the shell, which is readily opened for inoculation or other manipulation and easily sealed again for the period of reincubation.

The original purpose of the present study was to determine whether the fertile egg could be used as a medium for testing the inactivating effect of antiseptics on viruses. Such studies could be made only if the normal physiology of the embryo is not greatly disturbed by the injection of such agents.

Three tests were performed on different days with each substance. Embryonated eggs which had been incubated for 6 or 7 days were candled and the location of the embryo marked on the shell. This mark was kept uppermost until the inoculation was completed. A hole was drilled through the shell over the air sac by means of a 2 mm dental bur or a carborundum disc. The injection was made by means of a 2-inch, 20 gauge needle fitted to a tuberculin syringe. The needle was directed slightly upward and inserted 3 cm into the egg. The amount injected was 0.05 cc in each instance. This represents 1 part in 1000 of total egg weight, or the equivalent of 70 cc for a man weighing 70 kilos. The eggs were candled daily and the day of death noted. The results are shown in Table I.

The minimal lethal dose for man has not been determined for many of these substances. In Table II the smallest amounts of phenol, bichloride of mercury, and iodine which cause death in man are expressed in grams per kilo of body weight. The corresponding figures for the chick embryo are also given, taking the minimal lethal dose as the amount which kills more than half but not all of the embryos. The similarity between the toxicity of these substances for man and for the chick embryo is striking.

[2] McNally, W. D., *Toxicology*, Industrial Medicine, Chicago, 1937, 108, 206, 812.

[3] Solis-Cohen, S., and Githens, T. S., *Pharmacotherapeutics*, D. Appleton & Company, New York, 1928, 547, 671, 750.