examination of smears stained by the Gram method to be free from bacteria.

The primary purpose of the experiment was to maintain the trichomonads in the chick embryo. Because of inadequate facilities, no infected embryos were kept for more than 3 or 4 days after being inoculated. During this 3- or 4-day interval, the total mortality of all embryos was 23%. No experiments have been performed to determine the effect of the trichomonads on the chick embryo. However, two observations indicate that, in the experiment described, no increase in pathogenicity of strain HGP2 occurred. First, there was no progressive increase in mortality of the embryos. A high mortality which occurred suddenly in the thirteenth and fourteenth sets of embryos was probably due to difficulties encountered with the incubator during that time. Secondly, embryos which were inoculated with material from dead embryos showed no significantly higher mortality than those inoculated on the same day with material from live embryos. The genealogy of some of the trichomonads could be traced through 14 embryos alive at the time of inoculation and at the time of removal of allantoic fluid.

Conclusion. *Trichomonas foetus* has been grown successfully in chick embryos through 14 generations (and probably could be continued indefinitely) when the parasites are inoculated beneath the chorio-allantoic membrane as described above.

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Further Studies on the Regeneration of the Aqueous in Man.

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If the aqueous of a human eye is aspirated through a fine hypodermic needle, introduced into the anterior chamber through the periphery of the cornea, several reactive processes are set up within the eye.* The formation of new intraocular fluid and characteristic reactive fluctuations of the intraocular pressure are probably the most important of these processes. We reported[1] the results of ex-

*This proceedure is hereafter referred to as anterior chamber puncture (ACP).

[1] Kronfeld, P. C., and Lin, C. K., *Transactions Amer. Acad. Ophth. and Otolar.*, 1937.

periments which were undertaken to determine the rate of formation of new intraocular fluid. The anterior chambers of human eyes which, from the viewpoint of the clinician, appeared to be nearly normal were emptied completely by ACP and the amounts of fluid thus obtained measured. One hour later this procedure was repeated whereby the amounts of fluid regenerated in one hour were obtained. These data were interpreted to indicate independence of the rate of fluid regeneration from the original chamber volume. "According to these data, the regeneration of the aqueous takes place at the same absolute rate in all the eyes represented in the table, the result being that an originally deeper chamber." This interpretation was corroborated by the results of experiments in which the intraocular tension was followed after ACP. The so-called restoration time (the interval between the ACP and the time at which the original level of tension is reached again) was found to be directly dependent upon the original volume of the chamber, longer restoration times being characteristic of eyes which had deeper anterior chambers originally and *vice versa.*

In the same communication it was also reported that the intensity of some of the other reactive changes which follow ACP appears to be proportional to the intensity of the eliciting stimulus, that is, to the amount of fluid withdrawn or, in other words, to the amount of fluid originally contained in the anterior chamber. It was difficult to understand that this proportionality should only apply to some of the reactive changes and not also to the rate of fluid regeneration. We have, therefore, continued our experiments and determined, on a number of fairly normal eyes, the amount of fluid regenerated within the first 30 minutes after complete emptying of the anterior chamber. The punctures were made with 23 gauge needles under local anesthesia which consisted of 4 instillations of 2 drops each of 1% pantocaine given at intervals of 3 minutes, plus the direct application of the same solution with cotton applicators to the upper and lower limbus at which places the eyeball was held with 2 fixation forceps during the puncture.

In none of these cases did the ACP produce any lasting untoward effects with regard to appearance or function of the eyes which were subjected to this procedure. In some of the cases of retrobulbar neuritis or optic atrophy temporary or lasting improvement of the vision was noted after the ACP. ACP may, therefore, be considered a therapeutic procedure in these cases.

The volumes of aqueous obtained by the first (v_1) and the second (v_2) ACP are presented in Table I and Graph 1. Before interpreting these data the principal sources of error involved in such

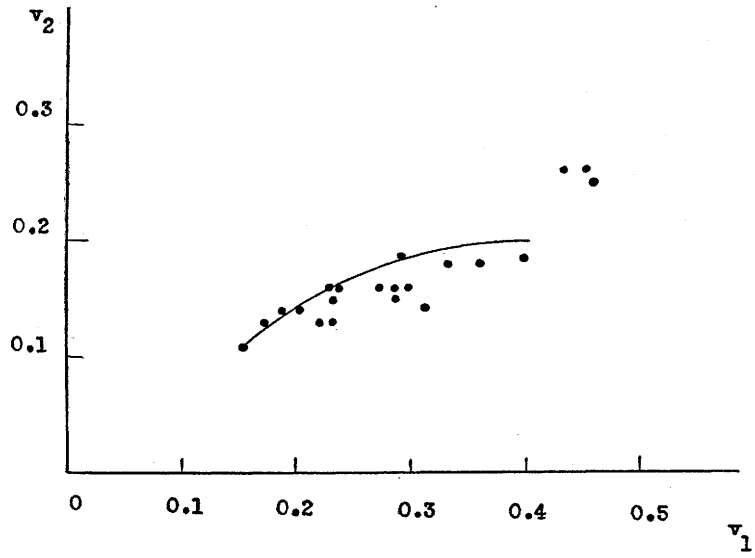
TABLE I.

No. of patient	Age	Vol. of aqueous in cc obtained at 1st ACP (V_1)	2nd ACP (V_2)	Min. between 1st and 2nd ACP	Clinical condition
61408	37				Concomitant convergent strabismus of the right eye. Left vision: with + 2.00 sph = 6/6. Right vision: with —8.00 sph with —1.25 cyl × 150 = 6/10
Left Eye		.172	.130	30	
Right "		.235	.160	30	
61342	14				Mild chronic retrobulbar neuritis of both eyes, probably due to dietary (vitamin) deficiency. Left vision: with —4.00 sph = 6/10. Right vision: with —4.00 sph with —1.00 cyl × 30 = 6/10
Left Eye		.430	.260	31	
Right "		.455	.250	31	
58469	19				Concomitant divergent strabismus of the right eye. Right vision: with —0.75 sph with +1.50 cyl × 150 = 6/6. Left vision: with +1.25 sph = 6/5-2
Right Eye		.288	.185	30	
60810	31				Polyneuritis and retrobulbar neuritis of both eyes, due to dietary (vitamin) deficiency. Left vision: 6/10. Right vision: with —0.25 sph with +0.50 cyl × 105 = 6/10
Left Eye		.185	.140	30	
Right "		.200	.140	30	
383204	22				Retrobulbar neuritis of both eyes, cause unknown. Left vission = 6/15, Jaeger 4
Left Eye		.330	.180	29	
60813	24				Polyneuritis (without retrobulbar neuritis), due to dietary (vitamin) deficiency. Right vision: with —0.75 sph = 6/10
Right Eye		.220	.130	31	
56184	15				Concomitant convergent strabismus, alternating. Right vision: with —0.25 sph with +1.25 cyl × 60 = 6/10
Right Eye		.286	.150	30	
61821	25				Polyneuritis (without retrobulbar neuritis), due to dietary (vitamin deficiency), slight degree of vitamin A deficiency. Left vision: with —0.50 sph = 6/10. Right vision: with —0.50 sph = 6/15 + 3
Left Eye		.355	.178	31	
Right "		.394	.186	31	
57957	21				Chronic retrobulbar neuritis of both eyes, cause unknown, partial optic atrophy of both eyes. Left vision = 6/20, Jaeger 2. Right vision = 6/20, Jaeger 2
Left Eye		.237	.160	33	
Right "		.230	.150	30	
61470	24				Polyneuritis (without retrobulbar neuritis), due to dietary (vitamin) deficiency. Left vision = 6/10 (small central corneal scar)
Left Eye		.230	.130	30	

TABLE I (Continued).

No. of patient	Age	Vol. of aqueous in cc obtained at 1st ACP (V_1)	2nd ACP (V_2)	Min. between 1st and 2nd ACP	Clinical condition
389674 Left Eye	18				Retrobulbar neuritis of both eyes, cause unknown, partial optic atrophy of both eyes. Left vision = counting of fingers at 3 meters. Right vision = 3/20
3-25-38		.296	.160	30	
4-8-38		.280	.160	30	
Right Eye		.310	.139	30	
Left Eye	45	.150	.113	30	Mild trachoma, corneal scars, presbyopia. Left vision = 6/20, with +2.50 sph Jaeger 5
364304 Left Eye	20	.268	.160	30	Healed retrobulbar neuritis of both eyes, cause unknown. Left vision =6/6, Jaeger 1
363813 Right Eye	16	.450	.258	30	Myopia. Right vision: with —.400 sph = 6/20, Jaeger 1

experiments should be considered. As stated in our previous communication, the determination of the volume of chamber fluid cannot be done with great accuracy because it is difficult to aspirate the last trace of fluid. The amount of aqueous left in the anterior chamber in the experiments reported here probably did not exceed 0.01 cc. Another possible source of error is loss of intraocular fluid by leakage during the interval between the two ACP. As a rule, the



v_2 plotted against v_1. Interval between the two aspirations 30 minutes.

Graph I.

track made by the first ACP becomes watertight immediately. Occasionally, however, the canal stays open for a period of hours or even days; the eye is said to be "fistulating". In the experiments reported here special attention was paid to the possibility of fistulation, but no signs of it could be noticed. Both of these sources of error tend to lower the results. The curve of Graph 1 is, therefore, based chiefly upon the higher and not upon the lower readings. Errors may also arise from heterogeneity of the material with regard to the characters which are being studied, that is, the depth or volume of the anterior chamber and the capacity of the fluid-producing apparatus. Unfortunately, the criteria of homogeneity or of heterogeneity with reference to these characters are not definitely known. Only the cases 61342 and 363813 of Table I with their unusually deep chambers and unusually high rates of regeneration seem to be definitely of a different type than the other cases.

The data contained in Table I and Graph 1 show that there is a relationship between the absolute amount of fluid which is regenerated within 30 minutes after complete ACP (v_2) and the original volume of the anterior chamber (v_1), v_2 showing a definite tendency to be higher in eyes with high v_1 and *vice versa*. Our findings are not regular enough to allow expression in mathematical terms. The relation between v_2 and v_1 does, however, not seem to be that of direct proportionality. Whatever the actual mathematical relationship between v_2 and v_1 may be, it is justifiable to state that the rate of fluid regeneration is, like some of the other reactive processes which follow ACP, dependent upon the original chamber volume. This chamber volume may, in turn, be considered a measure of the magnitude of the stimulus which the ACP constitutes for the eye.

The question may be asked why the data presented in the previous communication did not bring out this relationship. The answer is that the depths of the anterior chambers of the eyes in this first series (the independent variable) did not vary sufficiently, most of these eyes having anterior chambers of average depth. A material of this composition while it is almost ideally homogeneous can not be expected to bring out a regularity in the variation of the dependent variable (v_2).