TABLE I.
Effect of digitalis on "Q-T" interval.

Diagnosis	Date	"R-R" interval	"Q-T" interval	"K"	"T" lead II	Digitalis
Case 2		sec.	sec.		mm.	
Rheumatic mitral disease	June 6	0.580	0.330	0.433	9.0	None
	" 16	0.610	0.260	0.333	6.0	3.3 gm. in 10 days
Moderate heart failure	" 29	0.690	0.280	0.337	4.0	4.7 " " 23 "
	July 12	0.590	0.290	0.377	4.0	6.0 " " 36 "
Case 3						
Same, but severe failure	June 12	0.582	0.355	0.465	5.0	None
	" 14	0.660	0.330	0.406	4.0	1.4 gm. in 2 days
	" 19	0.580	0.270	0.355	4.0	2.2 " " 7 "
	" 28	0.568	0.275	0.365	4.0	2.7 " " 10 "
	July 10	0.590	0.270	0.352	4.0	3.3 " " 28 "
Case 5						
General arteriosclerosis	Mar. 18	0.510	0.300	0.420	4.0	None
	" 19	0.550	0.315	0.425	4.0	1.2 gm. in 2 days
Hypertension	" 20	0.560	0.305	0.408	4.0	1.2 " " 3 "
Chr. nephritis	" 21	0.570	0.295	0.390	4.0	1.4 " " 4 "
Coronary thrombosis	" 24	0.597	0.285	0.369	4.0	2.0 " " 7 "

formula, "Q-T" interval $= \sqrt{K \text{ "R-R" interval}}$, so that "K" is an index of the ratio, "Q-T" interval : cycle length.

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Biochemical Studies of Human Semen. III. Factors Affecting Migration of Sperm Through the Cervix.*

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The viscous mucus which normally fills the canal of the cervix uteri presents a first barrier to the migration of spermatozoa from the vaginal lumen to the upper parts of the tract where fertilization occurs. When a mass of this mucus is exposed to the action of normal seminal fluid, the gross appearance is that of a lysis, with loss of viscosity and disintegration of the mass, apparently due to specific enzymic action.[1] This action is inhibited by the presence in the mucus of notable amounts of pus, leucorrheal cells, etc.

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[1] Kurzrok, R., and Miller, E. G., Jr., PROC. SOC. EXP. BIOL. AND MED., 1927, **24**, 670; *Am. J. Obs. and Gyn.*, 1928, **15**, 56.

When the contact-boundary between normal cervical mucus and a normal semen specimen containing motile sperm is examined under the microscope, there is seen a gathering of sperm at the mucus surface which seems to be greater than can be accounted for merely by random swimming of the sperm. There is no evidence, however, of any attraction-field of the mucus surface exerting any influence on the distribution of sperm in the seminal fluid except in a narrow zone along the contact of the fluid with the mucus. The sperm do not very readily enter the mucus mass, nor do they progress in it, once entered, as rapidly as they do when swimming in a perfectly fluid medium. When one or more have succeeded in penetrating the mucus, what appears to be a small halo of more fluid material in the mucus can frequently be seen about the head of the advancing sperm, suggesting "lysis" of the mucus mass, thus making possible the advance of the sperm. Frequently, when one or more have entered, others follow, like a phalanx of sperm, with very actively lashing tails, following the leaders, oriented in general in the same direction, appearing to move up a "channel" against a vigorous current formed by the swimming-motion of the tails of those ahead; at times several sperm are swept backward and out by this current. It might possibly be suggested that the gathering of the many sperm in the column, oriented up-stream, might be due to a "rheotropism".

This picture is most noticeable immediately under the cover-slip, where the confinement by the glass tends to exaggerate the crowding, but it appears to be a phenomenon occurring generally at various places on the semen-mucus contact.

The "pioneers" of the sperm in this penetration tend finally to slow up, and become non-motile or very feebly moving, lying embedded in the viscous mucus, with random orientation. On exploring further into the mucus, away from the semen contact, occasional non-motile sperm may be seen. Only rarely can "free-swimming" cells be found except where the "mass penetration" by the phalanx of sperm has advanced.

The mucus plug in the cervix, then, seems to present an obstacle to the advance of the sperm; but it can be penetrated, and this penetration does not seem to be a mere random phenomenon depending only on the fortuitous direction of swim of the sperm in the seminal fluid.

As a possible factor in the first orientation of the sperm migration in the tract, we considered the occurrence of a potential gradient. The pH of the vaginal wall is usually about 3.6; of the

semen 7.6; the pH of the mucus plug may be as high as 8.5 or more. We should expect a potential difference to occur across the interphase betweeen semen and mucus, due to the great motility of H and OH ions, and to other factors. Semen and a mucus plug were brought in contact in a narrow tube; KCl-agar bridges connected either side of the contact with opposed calomel cells, which in turn were connected with a potentiometer-galvanometer set. The boundary potential so measured was of the order of 3 to 5 (or more) millivolts, the mucus being electropositive to the semen. The distance of the potential drop (the thickness of the phase boundary) may be estimated, at most, at 50 μ; this gives a potential gradient of about 1 volt per cm.

When mucus samples containing many pus cells were used for the microscopic test, penetration did not occur. These mucus samples were acid. A few similar mucus plugs, tested with semen as above for the phase-boundary potential, gave negative or small reversed potentials. We have previously shown that such mucus plugs are not affected by the dissolving action of normal semen.

Under the influence of an imposed E.M.F the sperm, which carry a negative charge, are drawn toward the positive electrode. The effect seems to be a cataphoresis rather than a galvanotropism, since it is not due to orientation of the swimming sperm cell toward the electrode. With low voltage gradients the cataphoretic effect is difficult to observe under the microscope, being largely masked by the active random swimming of the sperm. By placing semen in the middle chamber of a cataphoresis tube, layering Ringer solution or buffers on both sides, imposing a potential difference on the two ends, and then counting the sperm in the electrode chambers of the tube, we have observed a marked tendency of sperm to move into the positive field rather than into the negative, even with gradients as small as 0.01 volt per cm.