Wolffian tissue. In the 5 grafts of transplanted embryonic male tissue, only 2 grafts contained recognisable Wolffian duct. One of these grafts was recovered from a normal female host; the other, from a castrate male host. In the latter graft a small piece of testis was present that had been inadvertently carried over with the original transplant.

Discussion. The results show that the Mullerian duct of 31-day to 50-day guinea pig donors transplanted to the anterior chamber will persist and continue to differentiate. Mullerian duct tissues from female donors differentiated into a recognisable uterus in all types of hosts. The differentiation of the uterus seems to be independent of the influence of host hormones since uterine glands, equal in development to that of normal females, were found in grafts from normal males, normal females and spayed females. Of even greater interest is the fact that tissue from a 31-day male donor in a spayed female host differentiated into a uterus with well developed glands. The results indicate that ovarian hormones are not necessary for the development and differentiation of the uterus, and that testicular hormone does not inhibit it.

Summary. (a) Anterior chamber grafts of embryonic guinea pig female reproductive ducts developed into uterus in all types of hosts. Definite uterine glands were found in grafts from all hosts except the castrate male. (b) Similar grafts of embryonic male reproductive ducts developed as Mullerian tissue, and in one case definite glands were present; in only 2 of these grafts was Wolffian tissue present also.

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Enhancement of Spreading Cortical Depression by a Dialyzing Technic (18220)

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Leão first described a response to stimulation of the exposed cerebral cortex of rabbits which he called spreading cortical depression (1). This phenomenon follows electrical or mechanical stimulation and manifests itself as a slowly migrating temporary reduction in the normal electrical activity of the cerebral cortex. Another manifestation of the depression wave is an associated transient reduction (7-15 Mv.) in the normal "D. C" potential of the cerebral cortex(2).

Although the rabbit is peculiarly susceptible to this reaction, protecting the cerebral cortex of cats and monkeys from exposure to room air by means of mineral oil effectively opposes the appearance of this response(3). However, it has been demonstrated in this laboratory that cooling the mineral oil covering the cerebral cortex makes it possible to elicit spreading depression with a high degree of regularity in rabbits, cats, and monkeys (4). In addition, the sequential phases of the migratory depression have been characterized and identified on the basis of the associated reduction in cortical "D. C." potential (4). The same designations have been used in identifying the "D. C." voltage changes (see Fig. 1) obtained in the experiments reported herein. The first important negative "D. C." potential change occurs at the proximal electrode E_1 (solid line) situated on the

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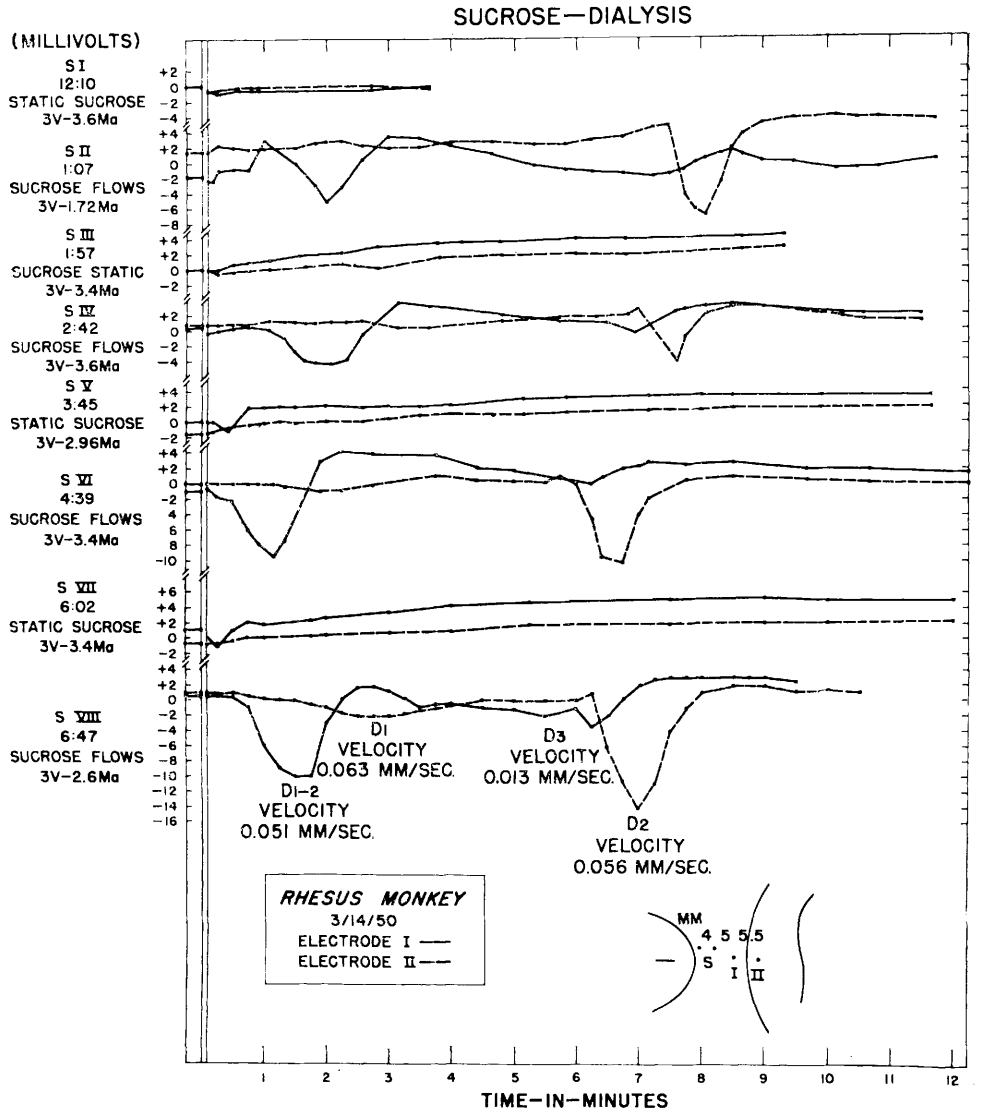

FIG. 1.

Illustration of spreading depression as indicated by the fall (in millivolts) of the cortical D.C. potential. Those stimuli labeled sucrose flows, illustrate propagated depressions following dialysis. Those stimuli labeled static sucrose, show that no depression occurred when dialysis did not precede stimulation.

precentral convolution. This reaction is labeled $D_{1\text{-}2}$. The next large "D. C" millivolt depression is recorded on the distal pick up electrode E_2 (dotted line) located on the postcentral gyrus. This reaction is labeled D_2 and indicates that the spreading depression has been propagated from the precentral to the postcentral convolution. The D_1, D_2, D_3, and D_4 reactions obtained in these experiments were also seen in the cooled mineral oil experiments and are mentioned to point out that similarity.

The experiments here described will demonstrate that the production of these same phenomena is aided by a virtual dialyzing procedure. The dialysis-like technic depended on the flow of a 9.95% sucrose solution across the surface of the arachnoid membrane.

TABLE I. Summary Table of Percentages.

Dialysis	No. of stimuli	Depressions on both electrodes: D_{1-2} and D_2 reactions are separated, %	Depressions on both electrodes: D_{1-2} and D_2 reactions are simultaneous, %	Depressions on both electrodes: Total %	D_{1-2} reaction on E_1 only, %	Depressions unrelated to stimuli, %	No depression obtained on either electrode, %
With	48	64.5	12.5	77	20.8	2.0	.0
Without	36	22.2	2.7	24.9	22.2	5.5	47.2

Method. Eight experiments were performed on 4 monkeys (*Macaca mulatta*) anesthetized with intraperitoneal dial (0.45 cc/kilo). Amplification and recording of the electrocorticogram as well as cortical "D. C." potential variations involved the same instrumentation described previously(3). The technic employed in these experiments depended on the construction of a plaster of Paris wall on the bone around the exposed brain. The wall contained tubes which permitted the continuous exchange of a 9.95% solution of sucrose in distilled water (isosmotic with human blood serum). After 20 to 30 minutes of exposure to the sucrose an electrical stimulation was given and the results recorded. The sucrose was then replaced by 2 to 4 changes of a phosphate buffered Ringer-Locke solution. After 20 to 30 minutes this physiological solution was replaced by 9.95% sucrose and another electrical stimulation was given immediately. In the last 2 experiments the phosphate-buffered Ringer-Locke solution flowed continuously over the cortex prior to its replacement by sucrose.

The technic thus consisted in giving one stimulus after a dialyzing procedure (flowing 9.95% sucrose) and then exposing the arachnoid surface to a physiological salt solution prior to another stimulus administered at once in static 9.95% sucrose without dialysis.

Results. Fig. 1 is a graphical representation of the "D. C." millivolt changes following electrical stimulation. Those stimuli labeled "static sucrose" (done immediately after replacing the salt solution with sucrose) produced no "D. C." millivolt reduction or spreading depression. In contrast, the stimuli designated as "sucrose flows" (done after 20 to 30 minutes of exposure of cortex to flowing sucrose) produced the typical propagated depression of electrical activity and "D. C." voltage.

The summary table of percentages indicates that all of the 48 stimuli given after flowing sucrose did not produce the ideal propagated depression response. Thus, 12.5% of the stimuli caused reactions which occurred on both electrodes simultaneously (or nearly so), and 20.8% gave an isolated reaction on the proximal electrode only. However, whereas 77% of stimuli following the dialytic method produced depressions on both electrodes, only 24.9% of those stimuli without dialysis produced reactions on both electrodes. In addition, 47.2%, or nearly half, of the stimuli which did not have benefit of sucrose exchange produced no variety of depression. In contrast to this, nearly 100% of all the stimuli following sucrose dialysis produced some variety of depression.

It is interesting that the D_{1-2} reaction on E, occurred following 20-22% of stimuli without regard to the use of dialysis. However, the average amplitude of this reaction after dialysis was 10.6 Mv. as compared to 5.3 Mv. in the control series. Therefore, the dialytic method did not increase the incidence of the D_{1-2} reaction on E, but did increase its amplitude by 100%. It is significant that the average 100% increase in amplitude of the D_{1-2} reaction did not suffice to make it propagate across the central sulcus to E_2.

A comparison of the amplitudes of propagated depressions with and without dialysis revealed another significant fact. The average total millivolt depression for the D1-2 reaction following dialysis was 11.3 Mv. and propagation occurred in 64.5% of 48 stimuli. Without dialysis the same reaction averaged 5.3 Mv. and successfully migrated to E_2 in 22.2% of 36 stimuli. The D_2 depression when present on E_2 had an average amplitude

of 9.0 Mv. with and 6.7 Mv. without sucrose exchange. Here, then, is evidence that spreading depression is not an all or none phenomenon. It can occur at the electrode nearest to the stimulators without propagating to the postcentral gyrus and when propagation does occur the amplitude of the reaction can vary in terms of the "D. C." millivolt swing.

There is some indication in our records that the brain wave amplitude decreases after exposure to static sucrose and increases somewhat when the sugar is continuously flowed through the pool. This effect could well be explained by electrolyte entering the stationary sugar medium from cerebrospinal fluid or brain and creating a partial shunt resulting in an apparent decrease in brain wave amplitude.

Therefore, substitution of Ringer-Locke solution for sucrose results in almost complete shunting of the electrocorticogram, creating a nearly isoelectric recording. In many experiments the above procedure caused discrete spikes to appear, especially on E_1, so that an otherwise isoelectric recording was punctuated at varying intervals by low amplitude oscillations.

In the last 2 experiments, the Ringer-Locke solution was permitted to flow continuously instead of remaining static during the period prior to control stimuli. Whereas 40% of the stimuli given after static Ringer-Locke exposure produced no response, 63.6% of the stimuli after flowing Ringer-Locke treatment yielded no type of depression. This result indicates that sucrose is not removing a non-electrolyte extractive but rather is attracting one or more of the ions present in the subarachnoid space and replaceable by the Ringer-Locke solution. This interpretation seems tenable, since exposure to the buffered physiological salt diminishes the incidence of spreading depressions and increases the number placed in the "no type of depression" category.

Discussion. The mechanism by which the sugar solution increases the incidence of propagated depressions remains to be conclusively demonstrated. Exposure to the physiologically balanced ion solution following the dialytic method appeared to decrease the incidence of spreading depression to a significant extent. This result suggests that the removal of one or more of the ions present in the subarachnoid space creates a deficient chemical environment conducive to an increased incidence of the spreading depression phenomenon. The postulated deficiency could be due to a simple reduction in electrolyte concentration or the inhibition of an enzyme system by the loss of an ion activator.

Summary. Exposure of the rhesus monkey's cerebral cortex to a flowing 9.95% sucrose solution significantly increases the incidence of the spreading depression reaction evoked by electrical stimulation.

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Relationship of Coagulase-Globulin to Prothrombin. (18221)

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In previous reports(1,2) we have shown that *staphylocoagulase* reacts with a plasma globulin factor, *coagulase-globulin,* to form a thrombin-like substance, *coagulase-thrombin. Coagulase-globulin* is, by itself, unable to clot pure fibrinogen. The reaction of *staphylocoagulase* with *coagulase-globulin* to form the active clotting agent yields hyperbolic time-concentration and conversion curves, similar to those obtainable for the conversion of prothrombin to thrombin. Because of other similarities, as well as some differences, in their action, it seemed necessary to investigate what part, if any, pro-

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