calvaria. Considerably more $C^{14}O_2$ was produced from isocitrate-5,6-C^{14} than from citrate-1,5-C^{14} by the homogenates. There was no indication that the amount of $C^{14}O_2$ produced from isocitrate-5,6-C^{14} differed between the control and experimental group.

The generation of $C^{14}O_2$ from citrate-1,5-C^{14} is impaired in PTE-treated calvaria. This effect cannot be accounted for on the basis of an increased pool size or a change in permeability of the cell. The most likely possibilities are that the inhibition reflects decreased activities or levels of an enzyme or a cofactor. As reviewed by Krane *et al*(7) the generation of $C^{14}O_2$ from citrate-1,5-C^{14} first occurs when $C^{14}O_2$ is eliminated from α-ketoglutarate-1,5-C^{14} to form succinate. Aconitase, isocitric dehydrogenase and α-ketoglutaric dehydrogenase are involved in this series of reactions. We have not so far been able to measure the activities of the individual enzymes. However, since the production of $C^{14}O_2$ from isocitrate-5,6-C^{14} and glutamate-5-C^{14} is unchanged, it is unlikely that the activities of isocitric dehydrogenase or α-ketoglutaric dehydrogenase are affected. It is possible that citrate-1,5-C^{14} oxidation is impaired due to decreased levels of aconitase or that in the intact calvaria NADP levels are reduced. Either effect would tend to cause the accumulation of citrate observed after PTE-treatment. This may not be the only factor elevating citrate levels, since there is increased glucose utilization(2) and lactate(6) oxidation by PTE-treated bones indicating that the rate of citrate production may be increased.

Summary. We have studied the metabolism of several labeled compounds (as indicated by $C^{14}O_2$ production) by mouse calvaria grown in tissue culture with and without parathyroid extract (PTE). The generation of $C^{14}O_2$ from citrate-1,5-C^{14} is impaired in PTE-treated calvaria. This effect is evident in calvaria maintained 2 days in culture and does not appear to be due solely to an increased pool of citrate. A decreased production of $C^{14}O_2$ from citrate-1,5-C^{14} of similar magnitude is observed in homogenates prepared from PTE-treated calvaria. $C^{14}O_2$ production from isocitrate-5,6-C^{14} is not altered by PTE-treatment of the calvaria. This inhibition of citrate metabolism may account for the increase in citrate levels observed in PTE-treated calvaria.

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Photographic Elimination of Transients (PET): A Simple Technique for Retrieving Bioelectrical Signals from Noise.* (29679)

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Bioelectronic recording techniques have become a fundamental research tool in basic and applied neurophysiology and psychology. Although the refinement of electronic apparatus has enabled bioelectrical measurement and recording to be made with great precision, the presence of noise or random discharges from the biological preparation itself

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may severely mask the desired potential changes and preclude waveform analysis. One solution to the problem of signal detection in noise utilizes mechanical devices or digital computers which superimpose and average a large number of electrophysiological records. Since the expectation of a random event is zero, algebraic methods reduce irregular background noise by a factor proportional to the square root of the number of observations(1). However, the cost of such computers is generally high and this precludes many laboratories from conducting detailed analyses of small signal evoked potentials. The purpose of this report is to present a simple photo-oscilloscopic technique of signal detection which is insensitive to the effects of large random transients. This technique may be utilized in present neurophysiological laboratories without modification of available equipment.

The components of the Photographic Elimination of Transients (PET) system are an oscilloscope and an integrated camera to photograph the beam tube face. A tape recording/playback system may be used in conjunction with this technique, or PET may be used directly from biological potentials. The PET procedure employs the multiple-sweep method by which a composite photograph is made of a number of similar superimposed waveforms from an oscilloscope display. Waveform alignment is obtained by triggering the oscilloscope sweep by an electrical pulse coincident with the stimulus presentation. However, PET differs from traditional sweep methods in that the intensity of the oscilloscope flying spot is reduced to the point where one full sweep does not appreciably expose the emulsion. By photographing superimposed displays of a repeatable biological event, a path will be slowly exposed which will correspond to the waveshape, amplitude, and latency of the biological waveform in the presence of noise or spurious signals.

The photographic emulsion may be considered to be a simple learning machine. By repeated spatial and temporal reinforcements from the oscilloscope trace, an exposure path is defined which corresponds to the biological event. Since unique electrical events are not reinforced, the emulsion does not retain noise or transients.

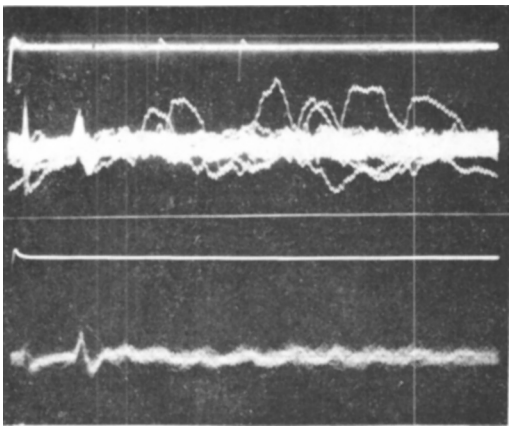

FIG. 1. Fifty superimposed evoked responses from the visual cortex of an infant rhesus monkey to stroboscopic stimulation. Upper half displays composite obtained by using normal multiple-sweep procedures. Bottom half displays increased waveform definition obtained by the PET technique with identical tape playback. Line above each record marks onset of stimulation. Total sweep time was 2 sec. Peak to peak amplitude of the primary biphasic potential was approximately 0.15 millivolt.

Fig. 1 presents a comparison of traditional multiple-sweep recording and the PET technique applied to identical evoked cortical responses from an 8 day old rhesus monkey. Silver disc electrodes were positioned over the occipital poles through trephined openings, and leads were connected through Grass P-5A preamplifiers to a Dacord tape recorder. Fifty light flashes 15 seconds apart were delivered at eye level from a Grass PS-2 photostimulator. Cortical electrical activity was continuously recorded on tape, played back through a Tektronix 561 4 channel oscilloscope, and photographed with a Beattie-Coleman camera with Polaroid 200 film.

The upper half of Fig. 1 illustrates the superimposed composite of 50 stimulations according to the traditional multiple-sweep method. The presence of noise and discharges from the biological preparation has made it extremely difficult to analyze the evoked waveform. The lower half of Fig. 1 illustrates the PET record obtained from an identical tape playback. The large primary

biphasic cortical response, as well as 8 well defined and regular after-potentials are clearly visualized. Noise and transient discharges have virtually disappeared.

Where applicable, PET offers certain advantages over computer averaging techniques. PET is not limited by channel capacity. Resolution is restricted only by the width of the oscilloscope trace or the slow variability of the waveform. PET will recognize 2 or more waveforms which alternate, rather than display a spurious composite. PET reproduces median or modal waveform rather than mean waveform. Whereas computer procedures store and process both information and noise, PET retains only repeated information and eliminates noise. In addition, line width and line brightness may be employed as indices of waveform reliability. Brighter and more narrow portions of a multiphasic wave will indicate greater repeatability or reliability of that waveform component. However, the determination of the variability in a biological potential must be statistically evalulated on the basis of individual waveform analysis(2).

This technique has been successfully employed in investigation of electroretinogram components as well as the postnatal development of evoked cortical potentials(3). With the addition of suitable electronic triggering circuitry, PET may be employed with aperiodic spontaneous electrical activity.

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Hyperfibrinogenemia and Thrombocytopenia After Staphylococcal Enterotoxin.* (29680)

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Staphylococcal enterotoxin elicits several biological responses resembling those produced by bacterial endotoxin. The first experimental feeding of enterotoxin to monkeys results in a transitory refractoriness to the emetic stimulus of enterotoxin which is distinct from permanent immunity. The temporal sequence of this tolerant state is similar to that of the "non-specific" resistance to infections and endotoxins following a single dose of endotoxin(1). Intradermal injection of staphylococcal enterotoxin alters the dermal reactivity of rabbits and guinea pigs so that injection of epinephrine into the same site results in a local hemorrhagic response. The local Shwartzman phenomenon can be produced by staphylococcal enterotoxin if bacterial endotoxin is employed as the provoking agent(2). The intravenous injection of staphylococcal enterotoxin into cats results in a biphasic hyperthermia(3). A reticuloendothelial blockading agent (Thorotrast) sensitizes monkeys to the emetic action of intragastrically administered enterotoxin(4). Mice and rabbits pretreated parenterally with staphylococcal enterotoxin are more sensitive to the lethal action of bacterial endotoxins (5).

The present communication is concerned with the effect of staphylococcal enterotoxin on 3 other changes effected in rabbits by bacterial endotoxins. Fibrinogen levels gradually increase after a single intravenous injection of bacterial endotoxin while the blood platelet counts decrease(6,7). Administration of bacterial endotoxin induces the appearance of an altered form of fibrinogen

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