

12-14 Electroanesthesia and the Effects of Pulsed Electrostatic Fields Prior to the Induction Stage

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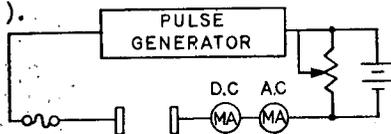
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If the cranial application of certain types of electric currents for the production of anesthesia is to become a reliable, safe and harmless method in the operating theatre, then the complications accompanying their use should be eliminated or at least minimized. These complications such as hypertension, hypertonus, tachycardia, hyperpyrexia, cardiac arrhythmias, cutaneous burns, excessive secretions of mucus and saliva are the main objections to the generalized use of electroanesthesia. One way of overcoming some of the difficulties would be to produce a state of relaxation and drowsiness before electroanesthesia without recourse to drugs. Such a state would allow the use of less current. We have recently demonstrated in monkeys, relaxing and mild soporific effects of certain types of electrostatic fields. The method below outlines the use of such fields, of 750 v/cm.

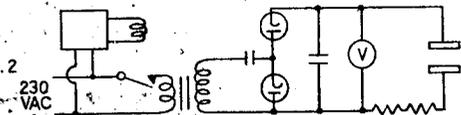
Apparatus and method. For electroanesthesia a rectangular pulse of frequency 100 per second and 1 millisecond width, was superimposed on a constant (d.c.) current, and applied to the head by bitemporal non-polarizable gold electrodes held in place by a thin rubber head strap. A.c and d.c milliamperemeters were connected in series with one of the output leads (Fig.1).

FIG.1



Electrostatic fields were obtained by using a 16,000 volt source from a cascade doubling circuit (Fig.2).

FIG.2



The field with a 100 c/s ripple between aluminium plates 25 cm. square, was pulsed 5 times a second by a relay operating on the line voltage. As a safeguard, thin perspex sheets of the same dimensions were fixed to the inside of the plates, and also a number of resistances totalling 60 megohms were connected in series with the positive lead (Fig.2).

Five male red patas monkeys (*Erythrocebus patas*) between the ages of 2 and 3 years, were selected for the initial tests, and 5 human volunteers including one of us (D.P.P.) were used for subsequent experiments.

The procedure was to expose the whole head with the fronto-occipital axis parallel to the field (forehead nearest the positive plate) for 1 hour at each of 10 sessions. The five

subjects were oriented as follows:- In the first case the head was under the influence of the field plus ions produced by discharges. The second was completely surrounded by an ungrounded Faraday cage of very fine copper mesh. The third was under the influence of the field alone, with a strong fan constantly ensuring circulation of fresh air; the fourth was completely screened from the rest, with plates in position but no current flowing, while the fifth was identically placed but in another room. Each subject had the gold electrodes in position bitemporally while between the plates. Following irradiation the plates were discharged and the electrodes quickly connected to the electroanesthetic source. Constant current was first started by the rheostat and rapidly brought to a value of 15 m.a, whereupon d.c pulses were commenced in steps of 1 m.a every 15 seconds until between 8 and 10 m.a were applied. The following were recorded every 5 minutes in anesthesia:- pulse, systolic blood pressure temperature near the electrodes, reaction to piercing of the palms and soles, pupillary light reflex, and muscle tone.

Results

Under the effect of electrostatic fields (cases 1 and 3), relaxation, and drowsiness were observed, when the surroundings were quiet. In humans the mind was clear at all times and memory unaffected. On commencing electroanesthesia in cases 1 and 3; constant current was maintained at 15 m.a while pulsed d.c only had to be set to between 6 and 8 m.a to produce the same level of anesthesia (plane I of the surgical stage). Pulse and blood pressure were between 15 and 20% lower than in the controls, while muscle spasm was diminished. The other complications were unaffected in all cases. In the controls (cases 2, 4, and 5) no relaxation or drowsiness was observed and the full current had to be applied to produce the same degree of anesthesia.

Discussion

The drowsiness caused by these pulsed electrostatic fields could be partly due to their monotonous repetitive nature, and partly to their action on enzyme systems.

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