zinc (Zinc Dust, Merck's Reagent) has been added to urines prior to the acid treatment. A marked rise in the estrogenic potency of urines from both pregnant and non-pregnant women has resulted (Table I).

"T_0" signifies the addition of 15 vol. % HCl and 10-minute boiling under a reflux condenser; T_{zn} the addition of 15 vol. % HCl and 4% Zn and 3-hour boiling under a reflux. Four percent zinc constitutes an excess with 15 vol. % HCl. Maximum increase in potency occurs after 2 hours and is not changed after 5 hours of boiling with acid and zinc. Evolution of hydrogen continues both during boiling and extraction. The titratable acidity is reduced from around 1.5 N to around 1.3 N in 3 hours of boiling. It is to be noted that hydrogenation does not affect a uniform increase in potency, since the ratios of T_{zn} to T_0, when assayed in olive oil, vary between 2.0 and 6.6.

The processes involved in this augmentation of urinary estrogen by zinc hydrolysis have not as yet been identified. The results thus far, however, are in accord with the hypothesis that the explanation lies in increased hydrolysis, and also conversion of estrone (but not estriol) into a reduced form of greater estrogenic activity, possibly dihydro-estrin (dihydro-theelin, estradiol). It is apparent for the present that hydrolysis with the addition of zinc may not be employed in physiological studies of estrogen excretion, although there is some indication that the ratio of T_{zn} to T_0 may provide an index of the relative estrone content of specimens analyzed.

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Changes of Hydrogen Ion Concentration of the Cerebral Cortex.

J. G. DUSSER DE BARENNE, WARREN S. MCCULLOCH AND LESLIE F. NIMS.

From the Laboratories of Neurophysiology and Physiology, Yale University School of Medicine.

Using a glass electrode (of the MacInnes type) with an active area of less than 0.5 mm.^{2}, in conjunction with the microvoltmeter recently described by Burr, Lane and Nims (1936), having a grid-leak of 100 megohms, it is possible to measure the hydrogen ion concentration in physico-chemical systems to $\pm$.002 pH. The same apparatus is applicable to biological systems *in vivo*. In the present instance it was used for a study of the pH of the cerebral cortex.

One glass electrode and 2 Ag-AgCl saline-wick electrodes were placed as close together as possible (circa 2 mm.) on a selected area of the cerebral cortex of the animal. The potential difference between the wick electrodes was measured with a microvoltmeter and a Leeds and Northrup galvanometer (No. 2420). The E.m.f. between the glass electrode and either wick electrode was measured with the modified microvoltmeter and a similar galvanometer, in conjunction with a portable Leeds and Northrup potentiometer. The apparatus was so adjusted that the variations in these voltage differences could be recorded photographically with a moving-paper camera through its F/1.25 anastigmatic lens (focal distance 5 cm.). The 2 wick electrodes were placed on the cortex to determine whether or not potential gradients were so large or unstable as to invalidate a pH-measurement. The difference of potential between the glass electrode and either wick electrode can be correlated with a pH by standardization in buffers of known pH.

In this preliminary note we wish to confine ourselves to a few of the results thus far obtained.

1. The D.C. potential gradients are small enough to be neglected in estimating the pH to $\pm.05$, and stable enough throughout an experiment to permit differential measurements of pH to $\pm.005$, a precision more than sufficient for the measurements in question. 2. In the curarized animal (monkey, cat) under constant artificial respiration the indicated pH on the cortex is constant. Increase of ventilation produces a shift towards the alkaline side (see figure), decrease of ventilation one towards the acid side. In fact, it has been possible to maintain the pH on the cortex at any specified level compatible with life by proper adjustment of the ventilation. 3. Intravenous injection of sodium bicarbonate produces a shift towards the alkaline side, of hydrochloric acid towards the acid side, of Ringer-solution no comparable effect. 4. Thermocoagulation (at 80°C. for 5 seconds) of a small area of the cortex renders this area acid (*e. g.*, pH = 6.6) with respect to the adjacent normal cortex (*e. g.*, pH = 7.3). This acidity slowly increases during both the initial local vasoconstriction and the subsequent local vasodilatation and oedema of the thermocoagulated area.

From these findings we feel justified in concluding that with this method one measures pH, that, though the condition of the blood circulating through the cortex affects the indicated pH, this pH is that of the transudate on the surface of the cortex immediately subjacent to the glass electrode, and finally that the pH of this transudate is largely determined by the condition of that portion of the cortex, rather than merely reflecting its vascularity.

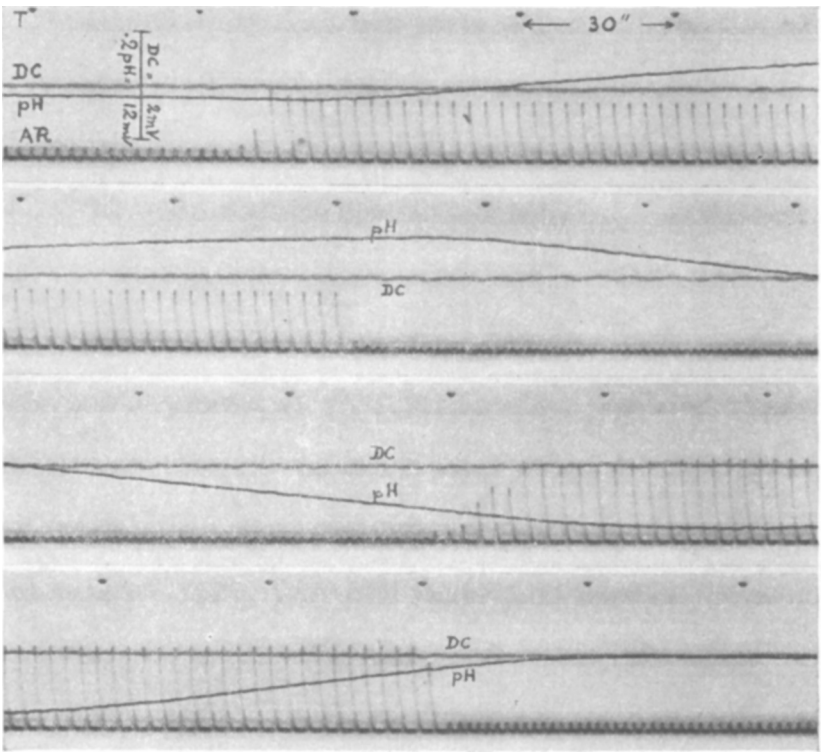

FIG. 1.

Monkey. Light Dial narcosis. Tracheal cannula. Curare. The four strips are continuous. T is time in half minutes. AR is artificial respiration. DC is potential between two wick electrodes about 2 mm. apart on cerebral cortex. pH is variation of potential between glass and one of the wick electrodes, also about 2 mm. apart on cortex; upward increase, downward decrease of pH.

Note that changes in artificial respiration are followed by shifts in pH without appreciable shift in D.C. potential, although the D.C. voltage sensitivity is 6 times as great.

5. Changes in pH of the cortex produce changes in its "spontaneous" electrical activity, a low pH being associated with low electrical activity, a high pH with high activity.