The mammary glands of the animals on the 1.0 mg level of androstane-diol showed a remarkable proliferation. The development of the ducts was complete and many lobules were present. All acini showed definite secretory activity, but not lactation. Androstene-dione at the 1.0 mg level showed a similar, but less marked effect. Androsterone exerted no detectable influence on the mammary glands.

The uteri of the animals injected with androstanediol (1.0 mg) showed a marked increase in connective tissue and smooth muscle and were not only much larger than the uteri of castrate controls, but were larger than at the beginning of the experiment. The uteri of the animals that received androstene-dione showed a slight stimulation, while those of the androsterone series were typically castrate.

The vaginal smears of all animals were consistently dioestrus throughout the experiment. In section the vaginas of the animals injected with androstane-diol and androstene-dione showed a slight mucification, while those of the androsterone-treated animals were typically castrate.

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FIXATION OF POTASSIUM IN SOILS[1]

FOR more than half a century the problem of K fixation in soils was investigated and discussed. It was noted that when soluble potassium was added to the soil a large portion of the K became unavailable. With the clarification of the phenomena of base exchange the immobilization of soluble K in soils was considered from the standpoint not only of its insolubility in H_2O, but also in the sense of its being non-replaceable. A number of postulates have been suggested on the mode of fixation. It was natural to suspect the silicates, the primary source of K in soils, as the seat of reactions involving fixation of the K added or released in soils. The one postulate which gained popularity in recent years was that the soluble K in soils reverts to a difficultly soluble complex resembling muscovite. No definite evidence to prove this contention has been advanced. It is perhaps somewhat far fetched to think of the formation of silicate minerals of K under conditions of temperature and pressure prevailing in the soil.

In a series of experiments, conducted by the authors, with artificially prepared silicates of various ratios of SiO_2/basoids subjected to alternate wetting and drying, no fixation of K could be demonstrated. The attention was then directed to other acidoids and it was found that the phosphates of a number of cation linkages are capable of fixing K in unavailable or nonreplaceable form.

Aluminum and iron phosphates were prepared and treated with solutions of KCl corresponding to applications of 7.6 per cent. of the total dry weight of the respective phosphate complexes. These systems, prepared in triplicates, were then alternately wetted and dried five times at 23°, 35° and 70° C. The complexes dried at 70° C. fixed the largest quantities. The iron phosphate fixed 72.15 milliequivalents of K per 100 grams, which represents 57.85 per cent. of the total KCl applied, and aluminum phosphate fixed 71.43 milliequivalents, which represents 57.14 per cent. of the KCl applied.

Other cation linkages have been tested under various conditions and they also were found to fix the K.

There is an indication that the NH_4 ion and perhaps other cations may be fixed in the same manner.

Pedological data on hand seem to fit in with the findings of the laboratory experiments on the fixation of K through the medium of phosphated complexes. There is a definite relation between the phosphated complexes of various cation linkages and the extent of K fixation.

A more detailed description of the data on hand, the probable chemical reactions involved in the mode of fixation of K by the phosphate complexes, and the implications involved with respect to systems of fertilization will be dealt with in a more extensive manner in a paper to be submitted to *Soil Science*.

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[1] Journal Series paper of the New Jersey Agricultural Experiment Station, department of soil chemistry and bacteriology.

SCIENTIFIC APPARATUS AND LABORATORY METHODS

A NEW TECHNIQUE FOR PRODUCING LESIONS OF THE ENCEPHALON CORTEX

TECHNIQUES for producing controlled lesions of the encephalon that are uniform in depth and limited to the cortical layers are comparatively crude and unsatisfactory. This is particularly the case when large lesions are desired and when chronic preparations are necessary. With small animals such as the rat, added difficulties arise from the spatial limitations of the small field of operation.

By adapting the copper point of an electric soldering iron, Dusser de Barenne[1,2] has devised probably

[1] J. G. Dusser de Barenne, *Zeit. f. d. Ges. Neur. u. Psychiat.*, 147: 280, 1933.

the best instrument to date. Several limitations of his technique of destruction, which are obviated by the method to be described herein, are deserving of mention. When the soldering iron technique is employed the area to be destroyed must be fully exposed. This requires the removal of bone equal to or in excess of the size of this area. Any minimizing of bone removal, especially when large areas are to be ablated, is conducive to a lessening of the operative shock and therefore increases the chances of survival of the animal. Direct entrance to regions along the ventral borders of the cortex requires the removal of surrounding bony structures. Certain of these deeper portions would be very difficult to reach with the copper heat applicator. Judging from photographs published by Dusser de Barenne of lesions produced by this method, there is considerable tendency for the middle portion of the destruction to invade the tissues more deeply than does the peripheral portion. This tendency was also encountered in devising our method, but apparently can be controlled to a greater extent than with the other technique.

A low voltage radio frequency thermo-coagulator,[3] developed for the production of controlled injury in the interior of tissue masses, has been successfully adapted to the problem of cortical destruction. The electrodes consist of two thin strips of spring-tempered steel 1 mm wide, .05 mm thick and 7 mm in length. They are soldered to two small brass pieces $.7 \times 4 \times 10$ mm, riveted to a rectangular bakelite handle $2 \times 10 \times 50$ mm. The strips are arranged parallel, with their flat surfaces in the same plane, and are separated by 3.5 mm. The brass pieces extend longitudinally about 3 mm beyond the end of the bakelite, the extended parts being bent 45° so that the plane of the electrodes intersects the plane of the handle at its end. Light-weight flexible connection wires are attached to the brass pieces. The soldering of the steel strips to the brass pieces is best carried out while holding the two strips together and in alignment with a small toolmaker's parallel jaw clamp. The brass parts are coated with bakelite insulating varnish.

The electrodes are inserted through a pair of small holes made with a dental drill trephine and are carefully slid between the dura and the inner surface of the skull into the desired position. Since the steel strips are quite flexible, they follow the curvature of the skull within limits. Applying approximately 16 volts of radio frequency energy across the electrodes destroyed the cortical tissue to a depth of .8 mm and to a width of 6 mm along the entire length of the electrodes. Variation in the depth of destruction can be obtained by varying the magnitude of the voltage and the duration of the exposure. When smaller localized lesions are desired a suitable portion of the electrode surface is rendered inactive through the application of insulating varnish. It is possible in this way to create local lesions in areas that are inaccessible to other methods without considerable incidental destruction, although the electrodes are more difficult to place because of their added stiffness. Larger areas of destruction can be obtained by using larger electrodes and increasing the spacing between them.

Uniform results can only be secured with a properly designed source of radio frequency energy.[4] The cross-sectional shape of the lesion is affected by the width and spacing of the steel strips, the voltage and current density and the duration of the exposure. Incorrect parameters may lead to lesions surrounding each electrode only or to a single ellipsoidal region instead of the desired contour approximately rectangular in shape. Calibration may be most conveniently carried out through the use of a rapid method developed by one of the writers for investigating the action of radio frequency currents in cell masses.[5] Blocks of tissue from the root of the common garden beet are used. The electrodes are placed on a freshly cut surface of this material and covered with a glass slide. After exposure to the current, free-hand sections of about .5 mm are cut and soaked in tap water for one or two hours. Cells that have been injured will suffer a loss of pigment and become clearly differentiated.

Calibrations made in this way will not hold precisely in the living animal because of the influence of structures characteristic of the vegetable cell, and because of the cooling and distributing action of blood circulation in the animal. Nevertheless, the results are in approximate agreement. A few brain sections worked up by the conventional method, supplemented by preliminary experiments with the beet tissue, avoids much of the really formidable amount of work that is otherwise expended in preparing sections. This method also has proved very useful in developing the technique for producing internal lesions in cell masses.

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A METHOD OF MOUNTING MAPS

MOUNTING of maps on muslin or linen for use in the field or in the classroom is standard practice in

[2] J. G. Dusser de Barenne and H. M. Zimmerman, *Arch. of Neur. and Psychiat.*, 33: 123, 1935.

[3] C. W. Brown and F. M. Henry, SCIENCE, 79: 457, 1934.

[4] C. W. Brown and F. M. Henry, *Proc. Nat. Acad. Sciences*, 20, 310, 1934.

[5] F. M. Henry, *Yearbook Carnegie Inst. of Wash.*; 30: 265, 1930.