affected by increased muscular exercise. The source of muscular energy is the carbohydrates of our food modified by the digestive processes, and the waste products of muscle activity are non-nitrogenous bodies. Hence, with an increase or decrease of chemical action in muscle, one would not expect the urea to be influenced. As we have seen, cocaine has little action on muscle, but cocaine and benzoylecgonine affect it profoundly in the same way apparently as caffeine does. The influence of caffeine on urea excretion has been frequently investigated with somewhat contradictory results, but this much is certain, that it makes very little difference one way or the other, so far as the total nitrogen excreted is concerned.⁶⁶

It is conceivable, although no experimental data exist to support such a supposition, that such substances as cocaine or caffeine, which undoubtedly modify the vital processes in muscle even to the production of rigor mortis, may also affect its chemical activity, so that it is capable of performing an equal or greater amount of work with a lesser consumption of carbohydrates. If this were the case, these bodies would act as economisers of food (*aliments d'épargne, Sparmittel*) not in the generally accepted sense of preventing the breaking down of the nitrogenous body tissues, and thereby diminishing the excretion of urea, but in diminishing the consumption of non-nitrogenous substances by the muscles. It seems hardly probable that the wonderful power of endurance shown by the Indians, and their long fasts while undergoing excessive fatigue, can depend solely on stimulation of the nervous system. There must be at the same time an economising in the bodily expenditure, an idea which is further confirmed by the total absence of emaciation or other injurious consequences.

In passing, it may be interesting to point out that caffeine has an entirely different constitution from the coca alkaloids. It is not a pyridine base, but is trimethylxanthine (xanthin in which three hydrogen atoms are replaced by methyl) thus:

If it be the case that coca diminishes the consumption of carbohydrates by the muscles during exercise, then less oxygen will be required, and we have ready to our hand an explanation of its action in relieving breathlessness while ascending mountains. At the same time we must not lose sight of the fact that such an effect has not been demonstrated, and that the stimulation of the nervous system is probably also an important factor.

As I have had considerable difficulty in collecting from original sources information regarding coca, it may lighten the labours of others if I add a bibliography. A number of physiological papers besides those quoted in the text have been published, and these I also give, but I have omitted all purely therapeutical and toxicological articles, as they are exceedingly numerous, and are to be found scattered through all the principal medical journals since 1884. The list, however, is by no means a complete one, as there are many Peruvian, American, and other foreign publications which I have been unable to obtain. Some of these are to be found in the Index Catalogue of Library, Surgeon-General's Office, United States Army, and in the various Dispensaries.

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THE ELECTRICAL TREATMENT OF UTERINE TUMOURS.

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ALL that my present experience will justify me in vouching for the efficacy of this method of treatment is that in some cases it will cause a fibroid tumour of the uterus to entirely disappear, that in others it will remove it partially, and that in most cases the symptoms which have caused the patient to seek assistance may be relieved or quite cured. In support of these statements I will briefly relate four cases which I have treated by electricity.

CASE I.—Miss L., aged 32, was first seen by me in 1882, when I found two small fibroids in the anterior wall of the uterus. She complained of pelvic pain extending down the legs, easily brought on and increased by exertion. Bromides and leeching relieved this and kept the growths in check. In 1884 I saw her again, and found a slight enlargement of the tumours, especially the one on the right. In 1887 this began to grow rapidly, and when measured on November 7th of that year its antero-posterior diameter was found to be three and four-tenths inches. Electrical treatment was begun on October 29th, 1887, abdominal positive, and intra-uterine negative electrodes being used, with a current of intensity varying from 60 to 150 milliampères for ten minutes about every four days, avoiding a few days before and after the catamenial periods. A higher intensity than 150 milliampères could never be borne, as the tumour was tender and the patient very sensitive. On January 14th, 1888, measurement showed that the fibroid had decreased in diameter from three and four-tenths inches to two and six-tenths inches, and the electrical treatment was continued until March 14th when, as it appeared the growth had ceased to diminish, galvanopuncture was employed with a current of 70 milliampères. The pelvic pain was much increased by this, and the patient complained of a "sore feeling" in the tumour. There was, however, no rise of temperature nor fever.

⁶⁶ Voit, *Ueber den Einfluss des Kochsalzes, des Caffeins, etc.* München, 1880.

The electrical treatment was suspended for five weeks. On April 13th measurement was again taken, and the tumour was found to be reduced from two and six-tenths to one and eight-tenths inches. On this day only a current of 60 milliampères could be borne. Gradually, however, the usual intensities were tolerated, and the treatment was continued until July 23rd, when measurement showed that only a slight reduction had taken place, it being one and six-tenths inch in diameter; and it is probable that nothing less than a repetition of the galvano-puncture will cause a further rapid diminution. Besides the diminution in the bulk of the growth other improvements accompanied the treatment. The periods which had been irregular with dark discharge and clots, became regular, of proper colour, and free from clots. The patient's face looks more healthy and has lost the distressed appearance. She writes, "The waist is less by two inches, the body certainly smaller, and the pain decidedly less in intensity before, during, and after the periods." I am able for the first time, to append a diagram showing the actual reductions in the diameter of the tumour observed at different dates as above mentioned.

Diagram I.—A. Diameter of tumour November 7th, 1887, 3½ inches. B. January 14th, 1888, 2½ inches. C. May 13th, 1½ inch. July 22nd, 1½ inch.

CASE II.—Mrs. G., aged 38, has had no children. She was first seen by me in 1885, when she was suffering from excessive menorrhagia, and had a large fibroid reaching above the umbilicus. Treated by bromide and chloride of ammonium, ergot, rest, and hot-water syringing, the tumour diminished until it came to a level with the umbilicus, but beyond this I could not succeed in reducing it. January 9th, 1888, I began the electrical treatment with abdominal-dispersing and intra-uterine electrodes, administering a negative electric current, varying from 80 to 160 milliampères. No galvano-puncture was used in this case. The treatment was continued during the inter-menstrual periods at intervals of four days, the number of electrifications being about six each month. At the end of February it was evident the tumour was diminishing, and thus encouraged, the treatment was continued with unabated success until July 19th, when the fibroid was found reduced to a remarkable extent. Her dress had been gradually taken in several inches, and the belt she was in the habit of wearing to support the tumour became useless and rode up to the waist. The uterus was causing some pressure in consequence of its being able to descend into the pelvis, and a support will probably soon be needed. The patient is delighted at having regained her figure, and speaking of the enlargement says she has now "quite to hunt for it." She is now practically rid of her incumbrance, although I hope to carry the treatment still further.

CASE III.—Mrs. B., aged 30, has had no children; the periods irregular, occurring at intervals varying from five to nine weeks. She has pelvic pain increased by standing. December 31st, 1887, I examined her under ether, and discovered a fibroid the size of a small egg bulging out from the left side of the cervix. January 1st, 1888, electrical treatment was begun with dispersing abdominal and intra-uterine electrodes; negative electricity of intensity varying from 75 to 175 milliampères was used for five minutes every two or three days. During this month it was administered thirteen times. In February the treatment was continued in the same way, except upon the 6th, when galvano-puncture was employed through the roof of the vagina. After this the tumour, which had begun to diminish, continued to do so more rapidly. The ordinary electrical treatment was gone on with during March, and at the end of the month there was scarcely a trace of the fibroid discoverable. The pelvic pain had ceased, and the catamenial period had become regular. Electricity was discontinued, and when the patient was examined on May 8th the fibroid had utterly disappeared.

CASE IV.—Miss S., aged 41, catamenial period regular, but accompanied with membranes and clots. She has pelvic pain on the right side, and feels she cannot get about as comfortably as she did. I first saw her in December, 1887, when a fibroid was discovered in the posterior wall of the uterus the size of a closed fist, and it was causing inconvenience from its pressure in the pelvic cavity. In May, 1888, I saw the patient again, and found the tumour had increased rapidly in size, and could no longer be held in the pelvic cavity. Electrical treatment was commenced on June 7th. A negative current, of intensity varying from 85 to 125 milliampères, was used and repeated seven times between that date and July 24th. On July 3rd the tumour was found to be unmistakably decreasing, and the patient had passed a period without membranes and clots. On July 10th the uterus had again descended into the pelvic cavity, and had diminished to the size it was when I first saw the case. The patient is still under treatment. She comes from the country by rail every time electricity is used, and returns the same day.

REMARKS.—It may be said I have been precipitate in publishing these cases; but although it is true we must wait years before we can pronounce cures permanently perfect, still in a few weeks we may be able to announce important results, such as the diminution of the tumour and the relief of serious symptoms. Of course we cannot but feel that the electrical method is still in its infancy, and that the results must improve with further experience. It would be absurd to imagine that all the possibilities of electricity were already known and exhausted. We must patiently work on until we have discovered to what extent it can be used in alleviating or removing the sufferings of humanity.

It will be noticed that I have approached this method of treatment cautiously, and have used no high intensities, nor continued the current on any occasion more than ten minutes. Nor have I used any greater strength of current than the patient could bear without an anæsthetic. I have used no special antiseptic precautions, but have observed most careful cleanliness, especially ordering vaginal syringing with hot water, and seeing that the intra-uterine and puncturing electrodes were perfectly innocuous. No serious symptoms have followed my use of electricity, nor has there been any rise of temperature or fever. In two of the cases the tumours were rapidly increasing when treatment was commenced, and both began to decrease synchronously with the treatment. Some contend that these tumours become smaller by a natural atrophic process, and quite independently of electricity, but how do they account for tumours which have been rapidly growing, suddenly, upon the use of the battery, ceasing to increase and gradually diminishing in bulk? A repetition of these coincidences will perhaps in time open their eyes, and enable them to see the truth. One of these patients comes by rail from the country to have the electricity applied, returning the same day, and when at home going about as usual. This is an answer to those who say the progressive atrophy is due to rest. My cases also show that, although galvano-puncture is more rapid in its catalytic action, a great deal can be done without it. They also demonstrate that much good can be effected by currents of low intensity.

A celebrated surgeon, when shown over a hospital, was

1 Since writing this, I have been informed of considerable uterine disturbance and fever following my electrical treatment of a large uterine fibroid, but I am inclined to think the cause of it was the journey the patient took directly after the use of the battery.

once asked what he particularly wished to see. His answer was, "Show me your dodges." Acting on this principle I will, in conclusion, describe a few artifices which may be found useful. And first I would draw attention to my flexible callipers by means of which most uterine and nearly all pelvic tumours can be accurately gauged.² It consists of two ordinary pliable sounds united by two joints, one of which allows the ends of the sounds to be brought together and moved apart, and which can be fixed in any position by a screw, while the other permits the sounds to be separated and reunited in the same position by turning a button. The instrument may be used in a great variety of ways, and will give results as accurate as the most expensive arc-graduated callipers. The sounds may be made to occupy various positions, the abdominal surface, the bladder,

Diagram II.—Showing the first measurement of the tumour in Case 1. the vagina, the uterus, or the rectum, according to the site and surroundings of the tumour to be measured. The instrument can also be used as a pelvimeter by passing one sound into the vagina or bladder, and the other in the rectum. It is used in the following manner. Having bent the sounds approximately to the shape required by the parts to be measured, press the ends of the sounds together upon the points of the tumour most distant from one another; then let an assistant turn the screw until the joint is

This instrument and my dispersing electrode may be obtained from Messrs. Mayer and Meltzer, Great Portland Street.

rendered immovable. Next, let the button be turned, when the two sounds will be disjoined, and can be removed separately. Having reunited them, place them on a sheet of paper, and with a pencil make a tracing of the position of the sounds. The space between their ends will give the exact diameter of the tumour, minus the walls of the abdomen or organs to which the sounds have been applied.

This diagram will demonstrate one method of using the instrument.

For electrical treatment I use Gaiffe's portable battery, from which I have always been able to obtain more power than I required. It has satisfied me in every respect save one. When driving about with it the fluid has escaped from the cells, and the woodwork has become so swollen that it has been difficult, and sometimes impossible, to screw the cells up to put the battery in action. I have overcome this difficulty, and the spilling of the fluid is completely obviated by fastening, with a ring, a piece of india-rubber sheeting with a hole punched in it, over the mouth of each cell. This little contrivance has saved me much time and vexation.

One last word about dispersing electrodes. I have tried many. What we require is a flat pad, with a smooth surface, capable of absorbing water and holding within it a sheet of metal capable of being accurately adapted to the varying forms of the abdominal surface. If one part of the plate be pressed nearer the epidermis than another, a larger amount of electricity will pass from the body at that point, and pain, with perhaps a deep sore, will result. The ordinary plate cannot be made to adapt itself to a nodular or irregular surface, for if you make it concave longitudinally you cannot do so laterally, nor can you make it assume a spherically concave form. To overcome this difficulty I first tried a flat spiral of copper wire, but this got out of shape and one coil of wire overrode another. I now use a metal plate cut into a spiral ribbon, which answers perfectly, adapting itself to any surface however uneven it may be. It is placed between amadou or washleather and spongio-piline. The dispersing electrode thus made should be soaked in hot water and applied to the abdomen before any other arrangements are made, so that the epidermis may become thoroughly saturated and consequently less resistant to the current. Care also must be taken that the metal plug connecting the rheophore with the plate does not touch the skin; and the patient should be taught to hold the electrode upon the abdomen with an even pressure. The best way of drying the electrode after use is to put it on the floor with its waterproof side down, then placing a folded towel over it to tread upon it.

Such is a brief sketch of the progress I have made with the electrical treatment of uterine tumours during the past year, and I think many will agree with me in concluding that the little experience we have already obtained widens our responsibility, and must make us pause in recommending and adopting the more dangerous methods of treatment before giving electricity a fair trial. Oophorectomy and hysterectomy will, I fear, be necessary operations in some cases, but if the symptoms—pain, hemorrhage, and bulk of tumour—which render the patient's life miserable or useless can, even in some cases, be safely removed by the battery, then I say with Dr. Keith it is nothing less than "criminal" to recommend these dangerous operations until the safer method has been skilfully tested and found to fail.

THE ROYAL VETERINARY COLLEGE.—It will be convenient to medical men to know that, by virtue of a new by-law passed at a special meeting of the governors of the Royal Veterinary College, Members of the Royal College of Physicians, or of the Royal College of Surgeons (subject to the prescribed approval and election), who contribute one guinea per annum, shall, during the continuance of their subscription, be deemed subscribers to the College, and be entitled to the privileges of subscribers.

ICHTHYOL AND RESORCIN IN ERYSIPELAS.—Dr. Unna (*Monatsh. f. prakt. Derm.*, No. 5, 1889) recommends the treatment of erysipelas of the head by ichthyol or resorcin. He advises the employment of weak solutions of either remedy (1 to 2 per cent.) in the form of lotions, or he combines these remedies in stronger preparations with other remedies, with zinc ointments or zinc pastes, and claims that the spread of the erysipelatos inflammation can be prevented by such remedies. When the inflammation has spread beyond the scalp, he recommends that the edges of the inflammatory zone should be gently rubbed three to four times a day with equal parts of resorcin and zinc paste.