The only real disadvantage of this method is the expense entailed in providing the apparatus, for it is obviously out of the question for each physician who may have a breast abscess in his practice to provide himself with one or more bells and an exhaust pump for a condition which he may not meet again for some time, even years.

In the many breast abscesses that I have seen I have never seen such excellent results as I obtained in four of the above reported cases. I shall not hesitate to use the method further, and shall expect to have even better results than those above noted. If by this method we can preserve the function of the breast, and I think in most cases we can, then it is advisable to use it. Should the case go from bad to worse while the treatment is being carried out, then we always have the open surgical method to fall back upon. There is no question but that by this method we have a valuable aid in the treatment of breast abscesses, and one that should be more widely used than it is at present in this vicinity.

May 10, 1909. *Note.*—Since the above article has been in the hands of the Editors, Case III and Case IV have been delivered. Both are successfully nursing their babies without any difficulty. Case III has not as much milk in the breast that was operated on as the other breast.

ON THE EFFECTS OF COFFEE AND THEIR REMEDY.

BY WALTER WESSELHOEFT, M.D., CAMBRIDGE, MASS.

ALTHOUGH the deleterious effects of the persistent use of coffee are now generally conceded, it must be owned that the profession at large has been slow to realize a fact long known to careful observers and those dealing largely with sensitive and neuropathic individuals. It is only within recent years, however, since laboratory research has seized upon every article of consumption and sought explanations for every functional and structural alteration of health, that the effects of coffee have been subjected to the scrutiny of scientific investigation. The researches on the subject are now so exhaustive, its literature so extensive and the injurious action of coffee on the majority of those addicted to its use so fully attested, that further evidence is no longer called for. But for that large number who, judging from their own immunity, apparent or real, still hold coffee to be a harmless beverage, it may be well to note some of the most common and indubitable consequences of its use.

In general it may be asserted that the primary reactions of coffee are those of the central nervous system and, through this, of the circulation. Its secondary effects are seen in the muscular tissue (striated muscular fiber) and the digestive tract, and finally in functional and structural changes in the urinary system. These are by no means the only tissues possessing a selective proclivity for this pleasant poison, but they most promptly and most certainly respond to its stimulation. The earliest and most familiar effects are felt in

a slight degree of exhilaration, a genial glow or warmth, with acceleration of the pulse and respiration, heightened flow of thought, and courage to meet the problems and duties of the day, and, what many prize, an early desire to relieve both rectum and bladder. More exact inquiry reveals a shortened time reaction on sensory impressions and increased arterial tension. This is the agreeable stimulation experienced daily by the moderate coffee drinker in fair health, that quickening of all the functions so effectual in overcoming all the discomforts following insufficient or imperfect sleep or the results of common errors in diet and other minor transgressions. Unfortunately, too, it is this complex of pleasing sensations which tends to fasten on him or her who yields to its seductive influence the habit which, like the acquisition of other habits, is nothing less than a surrender to self-indulgence.

This habit once established may continue throughout a long life without perceptible injury, more particularly in those of a placid, unimpressible disposition. The excitation of the nerve centers in these is both transient and superficial in a sense, and the elimination of the exciting agent rapid. But this is by no means the rule. With the majority, especially those of what is popularly called a "nervous temperament," the habit is not borne without a cumulative effect and secondary phenomena. The first and most familiar of these is wakefulness or light, unrefreshing sleep, usually with disturbing dreams. Following upon the primary exhilaration, usually after some six or eight hours, the striated muscular fiber loses its tone, giving a sense of fatigue or indisposition to put forth an effort.* With this, and as its cause, a lessening of the excitability or responsiveness of both motor and sensory tracts of the chord, accompanied by restlessness and the psychical symptoms of irritability, depression, inability to think clearly or to form resolves promptly. Retarded and irregular heart's action with a sense of general pulsation is very commonly a distressing attendant upon the wakefulness at night, and cold extremities, even in warm weather, add to the general discomfort. All these sensations may exist for years in a mild form, but they constantly call for a redoubled expenditure of volitional force to meet the exigencies and duties of daily life, followed by a corresponding degree of fatigue, and necessarily suggest recourse to the pleasing stimulus by which for the moment the unhappy feelings are banished.

This point once reached the descent towards enslavement by the habit is easy and rapid. Without the "good" cup of coffee the day's work is not to be contemplated save with misgivings and disinclination. Wakefulness has become habitual, making still greater demands on the will-power to overcome the depression and indisposition to assume responsibilities; in fact, to preserve reasonable self-control. Many experience a condition bordering on melancholia, felt more particularly in the later hours of the

*H. Schulz, in Eulenburg's Real-Encyclopädie d. ges. Heilkunde.

day or on waking too soon after midnight. The slight sense of coolness following the first glow and the cold extremities increase to the point of great discomfort, paresthesias set in in the form of local numbness or a sense of coldness over extended areas on the back and elsewhere with marked tremor of the hands and uncertainty of their motions. The condition now presents a true picture of neurasthenia, of irritable weakness in a common form.

But this is by no means all. With the discontinuance of the use of coffee all these symptoms may be seen to disappear, usually in the order of their occurrence. But with the persistence in the habit further inroads upon the organism become painfully apparent. The digestive organs suffer, in part from the effects of the lowered nervous tone and in part from the irregular and enfeebled heart's action, together with the loss of normal arterial tension. The portal circulation grows sluggish, its veins distended, constipation, usually of a most obstinate character, sets in, followed by piles, and, in women, by leucorrhea and other signs of passive pelvic congestion. Capricious appetite, achylia gastrica, flatulency, abdominal distention, all the marks of nervous dyspepsia, migraine and headaches of various forms, and, finally, chronic congestion of the kidneys with cystic catarrh, complete the picture of utter nervous breakdown.

If any should look upon this as an overdrawn presentation of coffee effects, let them consult the appended bibliography on the subject. In point of fact, many clinicians of authoritative standing attribute to the use of coffee consequences far more grave than those enumerated. Eichhorst,¹ for example, charges the coffee habit with the production of arteriosclerosis, a view in which he is supported by Leyden² and Mendel.³ Surgeon-General Nicolai⁴ mentions not only forms of spinal degeneration, but proliferation of connective tissue in the kidneys and other organs as the effects of coffee. Goldscheider⁵ attributes to the same cause not only heart-neuroses, but grave structural lesions; while Virchow,⁶ in some of his most valuable treatises on popular hygiene, repeatedly warns against the use of coffee as a most deceptive and pernicious stimulant, possessing no nutritive value whatever. He, like many others, dwells on the evils effects on nervous people and warns against its use by nursing mothers, since the caffeine is thrown off by their mammary glands.

To answer the question whether the caffeine alone or other constituents of coffee give rise to the disturbances following its use, most minute experiments have been instituted with the usual result of wide differences of opinion, occasionally expressed with a bitterness denoting the intensity of the conflict. In the end, however, victory has perched on the banners of the anti-caffeinists, who have shown most conclusively that the alkaloid is the *materia peccans*. Nicolai, especially, with his assistants, Professor Lehmann and Doctors Newmann and Wilhelm, have given the subject the most exhaustive study by means

of various tests and control tests with the coffee of commerce, the same deprived of its caffeine, with this in its pure form, and with the caffeine or coffee-oil.

To describe these investigations in detail is no longer necessary. They were undertaken with a view to disprove — if I remember rightly — the contention of Boetticher, of Munich, who declared the odorless, almost tasteless, slowly soluble caffeine to be harmless, and the injurious effects experienced from the habitual use of coffee to be due to certain unknown principles which he promised to discover.* The parallel experimental tests with caffeine-free coffee, with coffee unchanged, with the extrative matters, oils, resins, and other constituents of the coffee bean, tests pursued with great circumspection and self-sacrifice, demonstrate most clearly where the cause of the injury lies.†

The question, then, of practical importance is whether it is possible to extract from the coffee bean the offending substance without at the same time depriving the infusion of its savor and aroma. This question has been most positively answered in the affirmative by the caffeine-free coffee now extensively used in Germany and other European countries.

In the preparation of this article the raw coffee beans are exposed in perforated drums to the action of superheated steam. This causes the hard cellular structure of the bean to swell and soften and the cell membrane of the individual cells to become penetrable to certain solvents of the caffeine. These solvents are ether, benzol, chloroform and allied substances, which are guided through the drums after the softening process is completed. The caffeine is thereby volatilized and made to escape to the amount of 9% of its volume. The remaining tenth, for some reason not yet disclosed, proves insoluble and unvolatilizable to such a degree that it is left behind, possibly in an allotropic form in which it remains inactive or, at all events, harmless.

Together with the caffeine the expulsion of certain waxy, resinous and oily substances is effected to the advantage of the commercial and hygienic value of the bean, since it is owing to these that rancidness sets in when coffee is kept in store, causing general deterioration, harsh taste and impure flavor. After the extraction of the caffeine the beans are dried and roasted with great care to the exact point of evolving the empyreumatic and setting free the essential oils, on which the fine taste and aroma of coffee depend. The whole process constitutes so great a

*These are by no means the only experiments in point. Many others of equal value and interest have been instituted. These are mentioned now mainly for the reason of their more ready accessibility and their convincing character.

†Since writing the above I find in the Berl. Allg. Med. Zentral. Zeit. of Jan. 23, 1909, pp. 56-7, a long and full apology for publishing the articles of "Dr." Boetticher. The apology was called forth by a detailed confession, under oath, on the part of this enterprising hack writer, first, that his name is not Boetticher, but Hugo Meier; second, that he has never graduated in medicine; third, that all his statements concerning experiments with caffeine-free coffee and all his assertions concerning its effects were pure inventions; fourth, that finding himself in straightened circumstances he offered to write for a certain company manufacturing a coffee substitute whatever might be demanded of him, and fifth, that he resorted to all manner of impositions to obtain the insertion of his articles in the Med. Zentral. Zeit.

triumph of chemical technic and applied science that from this point of view alone it cannot fail to excite both interest and admiration.

The chief value of the process, however, lies in the production of a pure coffee — not a substitute — which, while it retains all the desirable attributes of the original article, is wholly free from harmful properties.

A few cases from practice and experimental tests, such as can readily be made to throw much needed light on many therapeutic questions, and may be conducted without elaborate technic and apparatus, will serve to show that the discomforts and disorders following upon the habitual use of coffee are attributable to its caffeine.

CASE I. Heavy man, age seventy, vigorous health, but somewhat neurasthenic, advised to give up the habitual morning cup of coffee which was distinctly affecting his heart's action, causing troublesome arrhythmic pulsations, vertigo on rising, dyspnea and precordial pains on active exercise, especially on fast walking or mounting stairs, in addition to insomnia and much nervous irritability.

Dec. 30. Throughout the forenoon is conscious of missing the daily stimulus, with increasing sense of heat in head, oppression, palpitation and migraine-like headache. Great wakefulness at night, with restlessness and extreme irritability; constipation and frequent desire to pass water, with unusual flow of urine. This condition lasted several weeks, growing gradually less.

Nov. 30 began the use of caffeine-free coffee. The morning cup produced a slight glow and exhilaration, but no other sensible reaction. The continued use has been followed by no return of the old coffee symptoms.

By other members of his family similar experiences followed. All noted a marked improvement in sleep and a lessening of lassitude by day.

CASE II. Prof.—, age fifty-five; thin, spare, highly nervous man; dyspeptic; suffers from frequent attacks of sick headache, continuing often for twenty-four to thirty-six hours. Has long been unable to drink coffee, but uses tea habitually. Constipation, feeble appetite, insomnia. Distinct signs of sclerosis of coronary artery; angina-like attacks on rapid walking and all bodily exertion. Urine normal, but indications of prostatic enlargement, with irritable bladder and frequent micturition at night.

To discontinue tea; substitute caffeine-free coffee. At the end of a month headaches much better, sleep less disturbed, bowels more regular; can exercise more freely. General improvement, especially in the urinary disturbance.

CASE III. Mrs.—, twenty-eight. Primigravida, ten weeks. Extremely nervous, irritable and restless, with utter prostration, repugnance to food, great sleeplessness, constipation. Has used cascara almost daily. Every exertion causes extreme prostration, with depression and weeping. Frequent dull headaches, nausea, rarely vomiting. Urine normal, refuses food, but digests what she forces down. Craves coffee, which for years she has been unable to take by reason of its disturbing effects.

The usual dietetic and hygienic measures bring no relief. Try caffeine-free coffee. Whether the effect of suggestion or the satisfying of the craving, the whole condition promptly changed for the better; appetite, sleep, digestion and strength improve in most satisfactory manner and what is of special interest, no ill-

effects follow the continued use of caffeine-free coffee twice daily.

CASE IV. Mr.—, age seventy-three. Pronounced hypochondriac and neurasthenic, although in good bodily health. Has abandoned all active business chiefly from sense of disability, with increasing depression and loss of interest in all matters outside of his own health. Nervous dyspeptic, suffers extremely from flatulency; bowels regular; urine normal, but marked bladder irritability by day and night without signs of prostatic trouble. Strength fair, but shuns exertion; tremor of hands and imperfect control of fingers. Sleep satisfactory, though interrupted by bladder irritability. Heart's action regular; respiratory function perfect even on rapid walking uphill. Cold extremities even after exercise, and local paresthesias, chiefly in form of extended cold areas on back, felt at night under heavy bed clothing and unrelieved by hot bottles.

Has been for many years addicted to the daily use of the strongest coffee, to which may reasonably be ascribed many of the symptoms enumerated and a marked aggravation of a constitutional predisposition. No persuasion, advice or threat will induce him to give up his coffee, to weaken it or change his accustomed brand. On substituting surreptitiously the caffeine-free article he takes his usual amount without the least suspicion of change and with unabated enjoyment. Gradual improvement in bodily health, in many nervous and urinary symptoms after comparatively slight preliminary aggravation from sudden discontinuance of habitual stimulus. Psychic condition unchanged owing to degenerative processes in brain.

The interest in this case centers mainly about the fact that the patient detected no change in the flavor or aroma of the new coffee, although when away from home his complaints about unsatisfactory coffee are the rule.

CASE IV. G., age four, a healthy vigorous child of cheerful active disposition, but the offspring of neurasthenic parents. Functions all normal, sound sleeper. Jan. 28, pulse 76. Urine passed regularly at about four-hour intervals, never disturbed at night. Jan. 29, 7.30 A.M., 4 oz. of caffeine-free coffee of cookbook strength, with milk and sugar. Plays about as usual throughout forenoon, without signs of restlessness or nervous irritability. In fact, no change in conduct observable. Pulse 76, urine about every four hours, sleep at night undisturbed.

A long list of similar experiences might be added to those already available from distinguished observers. These from my own notes are typical and bear testimony to the salubrity and unchanged flavor of the coffee deprived of its alkaloid.

If, as we are constantly assured on high authority, preventive medicine is to be the chief aim and duty of the profession, dietary measures and articles must receive more scrupulous attention on the part of the general practitioner than has hitherto been accorded them. Despite much excellent instruction in recent years, a certain laxity regarding these matters cannot be denied.

From this point of view the substitution of a safe article for a harmful one in general use should arouse a widespread interest and invite the most careful and extended investigation by all intrusted with the preservation as well as the restoration of health in families and individuals.

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COFFEE AS A BEVERAGE, ITS USE AND ABUSE.

BY ROBERT AMORY, M.D., BOSTON.

THE writer of this article, having noticed in a printed statement that Colonel Younghusband advised the preparation of a coldwater infusion of coffee as a beverage, to be taken during long outdoor journeys into the wild country of Thibet, was tempted to prepare coffee in the same way for home use. The result of experience taken in connection with the investigation of the well-known composition of the coffee bean seemed to show that the same method can also be greatly improved for domestic use over the usual preparation of making an infusion by the use of boiling water. A cup of coffee may be prepared by passing cold water through finely ground coffee contained in a porcelain or china percolator such as the Austrian coffee biggin; this extracts only one ninth of the bitter caffeine and one fifth of the tannin contained in this bean; it will also preserve the aroma of the volatile oils contained in this bean. These advantages are so obvious that it deserves mention to those who are fond of coffee drinking but who wish to reduce the unpleasant results such as wakefulness, excitability and disturbance of digestive processes, these conditions being largely due to the presence of caffeine and tannin, which are very much more soluble in boiling and hot water used in the ordinary culinary preparation.

The writer has tested this method for a period of more than five years and is well satisfied with the experience. The following article is intended to show the difference between coffee made in the ordinary manner and that made by the "cold-water method" which it describes later.

It may be interesting to learn the experience of one who has spent a long life in studying methods of preparing coffee beverage in various forms, namely, with hot water, boiling water and cold water solutions for drinking. The errors of making coffee beverage should be viewed from the standpoint of its chemical and physical constituents. This article will begin with a description of these.

The coffee bean, which is the product of cultivation in many tropical countries, is gathered and dried by the sun and imported to the various market centers, where it is used to a very large extent, at a distance from the country in which it is grown.

This coffee bean, as is well known, cannot be used to produce an agreeable coffee beverage unless it is roasted and carefully ground to a fine powder; it should, while roasting, be continually

agitated in order to remove the loose particles of its envelope, taking pains to heat the ground bean equally throughout its interior.

Coffee bean contains, among other substances, caffeine, tannin and the volatile oils; the latter give the aromatic flavor, which is stronger when the liquid coffee is hot. This aroma will be increased if the grinding of the bean is rapidly conducted, because the friction will set it free. These aromatic oils will be readily absorbed by cold water used in making an infusion.

The substance called caffeine is supposed to represent the active principle of coffee, and exists as a latent element in the coffee bean. When isolated it is a "white powder" having a slightly bitter taste and an acid reaction. At 77° F. it is soluble in one ninth of the amount of water required for its solution in hot water (175° to 212° F.); its solubility is increased in water containing cerium salts, potassium and sodium salts. These salts are usually contained in spring and well water (hard water).

It will thus be seen that caffeine at a high temperature will require 5.2 parts only of water for its solution, while at a low temperature it will require about nine times as much; and it will also be noticed that its solubility is increased by the presence of certain salts which are usually contained in spring and well water.

Caffeine when given as a medicine, separated from coffee, often causes headache, and in rare instances of susceptibility in the individual, mild form of delirium, noises in the ears and flashes of light, showing derangement of hearing and eyesight. Caffeine, especially in the form of caffeine citrate, is used in some cases to relieve headache, though in other susceptible individuals it may increase it. Where the action of caffeine is not followed by disagreeable sensations, as before stated, its absorption is often followed by increased mental action, sometimes a period of depression, oftentimes exhilaration, and in these cases interferes with sleep. It has the peculiar action of exciting the muscles, and in susceptible people may produce irregular muscular contractions and tremors. It may also sometimes affect the pulsation of the heart, causing irregular action and interfere with the equable effect of circulation throughout the whole body.

Tannin (or tannic acid) is another ingredient of coffee bean. The Pharmacopeia (United States, 1900) states that it is soluble in cold water only to a slight degree, but very soluble in boiling water, and in its solution will turn blue litmus paper pink, showing its acid reaction.

In the vegetable kingdom tannin is found in the oak-gall and in a large number of other growths; both tannin and gallic acid with iron solutions form an inky substance suspended in water, which is favored by heated water. The action of tannin when swallowed produces an astringent sensation in the mouth, throat and gullet, and a disagreeable oppressed feeling in the stomach. Pure tannic acid appears in the form of a yellow-colored amorphous powder. It is used in medicine as an astringent and pro-