BROKEN SLEEP.

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In these strenuous times there has been probably no greater interference with the ordinary comfort of humanity than the broken sleep that has become such a widespread experience since the outbreak of war. The disturbance manifests itself in various ways: some cannot get off, but, once asleep, rest comfortably till morning; others go to sleep immediately on getting into bed, but wake during the early hours to toss and tumble a longer or shorter time until they fall anew into a troubled and unrefreshing slumber; others, again, hardly sleep at all, if their statements can be relied upon, though in most instances they at least doze more than they know. To all who suffer thus, in whatever degree, sleep, such as it is, brings no morning sense of refreshment and reinvigoration, and many are able only too truly to say with Job, "When I lie down I say, When shall I arise and the night be gone? and I am full of tossings to and fro unto the dawning of the day."

The sleeplessness which so often accompanies organic disease is a direct consequence of the primary ailment, and its treatment becomes merged in that of the general condition. But apart from disease, the sound and untroubled sleep of healthy youth comes to yield to a less settled habit of dreamless nights as the years go on. The drag upon tissue-life becomes responsible for diminished elimination of waste products, impaired capacity for perfect assimilation, and inability to respond fully to the demand of unusual effort. Moral responsibilities also multiply, and a progressive perception of the greater verities of existence creates new concepts of duty, which add to the burden of each day's endeavour. In addition to these causes, which are the normal fulfilment of life's destiny, the rhythmic process of natural sleep is liable to be interrupted by diverse disturbances of a functional type. The subtle problem of etiology is obscure, and cannot be given any one explanation. Every functional interruption of physiological processes is associated with a corresponding instability of the nervous centres, and there is no feature more insistent down the whole gamut of the complex symptomatology of neurasthenia than broken sleep.

In those who have inherited a gouty diathesis and who are of the neurasthenic type there is, after middle life, a striking tendency to an early morning disturbance of sleep. Somewhere between 2 and 4 a.m. rest is broken by a sensation of gastric discomfort revealed by flatulent distension and eructations of sour acrid fluid. Sodium bicarbonate or soda-mint tablets, or even a dry biscuit, affords speedy relief, and sleep returns. The explanation probably is an excessive secretion of gastric juice, such as is constantly met with in cases of fatigue dyspepsia. The trouble most frequently arises after a day of over-strenuous work or mental strain, especially if to this is added an unwise evening meal. It is a functional condition, due to pyloric spasm, which, when associated with acidity two or three hours after each meal during the day, and with tenderness in the epigastric region, is often attributed to duodenal ulceration. Its long continuance may ultimately produce a breach of surface in the duodenal mucous membrane, but with proper attention to diet and the assistance of suitable remedies, organic change may be obviated. This early morning waking is often the first symptom of excessive gastric secretion.

This terrible war has exacted from those who participate in its activities, as well as from those who "watch and wait," an enormous toll of misery both by day and by night. The man whose nervous system breaks under the strain of the horrors of active conflict finds his clinical counterpart in the mother, wife, or sweetheart at home, whose mental poise has equally, and after a similar manner, yielded to the burden of long-continued anxiety. Both have reached, through different channels, the limit of endurance, and the periodical repose which the nervous system can only obtain during sleep is interrupted, or, it may be, permanently broken.

The soldier suffering from shell shock cannot sleep because his cerebral centres have become obsessed and are kept active by the terrors of recent experiences. Similarly,

the anxious wife or mother cannot sleep because her mental anxieties have created an atmosphere of apprehension which fills every moment of her life, and cannot be soothed into recuperative oblivion owing to the imperfect quality of the rest which comes to her at night. Sorrow and suffering have become a dominating feature in almost every household. Life is no longer a struggle to escape accident and disease, but has become a purgatory of suspense and bereavement. The unspeakable horrors on battlefields and in prisoners' camps; the moans and mute appeal of suffering from numberless hospitals scattered all over the war area; terrible disasters at sea, and ghastly air raids at home, make dismal news our daily portion. The Angel of Death is abroad, and in one way or another his activities are evident in almost every corner of the earth. Peace of mind and safety of body, being alike imperilled, sleep, which is the guardian of both, has become fickle and unsatisfying.

There are admittedly great differences in the hours of sleep essential to the maintenance of individual health, but even when due allowance is made for personal idiosyncrasy it still remains true that under war conditions the normal nights of many have become disturbed and restricted. The physical changes which result from war rations, and particularly from the diminution of fats in the daily dietary, must be submitted to until supplies become again more plentiful; but it is of prime importance that habits of sleep should be preserved if the best chance for complete restoration of nutrition is to be maintained against the day when conditions of life resume the peaceful tenor of their way.

In order to effect this desirable end an attempt ought to be made by every middle-aged person who suffers from insomnia in whatever degree to mend matters by some attention to the details of routine habits. It is scarcely necessary to say that the bedroom should be well ventilated, quiet, and properly darkened. The bed coverings should be light, though sufficiently warm, and the pillows ought to be so arranged as to provide for a comfortable angle of support for the head. When cold feet are a source of discomfort bed-socks should be worn and the bed warmed before retiring to rest. No serious work should be engaged in after dinner, but an interesting and unexciting novel, or a game of some sort, is often a useful preliminary to going to bed. Exercise in the open air to the extent of a two-mile walk daily is desirable, and, for those who are well enough and can arrange it, a weekly afternoon spent on the golf course, the bowling green, or the croquet lawn will be well repaid. The morning bath should be warm—from 95° to 100°—and a few minutes may be devoted, with advantage, to abdominal massage under the water. When the state of the general health is such as to offer no counter indication, a Turkish bath once a week is a wise procedure. The old-fashioned plan of a hot mustard and water foot-bath at bedtime is useful in many cases.

A tablespoonful of paraffin taken before breakfast will serve to lubricate the intestine and keep the bowels in order, and once or twice every week 1 grain of calomel, with $\frac{1}{2}$ grain of extract of colchicum made into a pill with 3 grains of rhubarb or colocynth, will provide for hepatic efficiency. If the bowels require help otherwise, a suitable dose of a mild aperient water, of which several manufactured in this country can now be obtained, or other simple saline, should be taken in the morning immediately after the bath. It is important to prevent, as far as possible, gastro-intestinal fermentation, and to this end periodical courses for about a fortnight of such a combination as the following may be recommended: Charcoal, beta-naphthol, ox gall, guaiacum, of each 3 grains, put into a capsule, and taken forenoon and afternoon. The dietary must be arranged so as to include meat and tea once a day only, and to limit sugar and carbohydrates. The evening meal should be light; it may comprise a teacupful of clear *consommé*, fish, chicken, or eggs with green vegetables cooked as a *purée*, and an omelette, custard, or junket with cream when obtainable, or a simple savoury. The question of stimulant is debatable, but a glass of light claret, chablis, or moselle is agreeable to many, and promotes digestion. An ounce of brandy or whisky taken in hot milk, or Benger's food, or arrowroot after getting into bed is, as a rule, a useful nightcap.

When, in spite of attention to such details, the nights still remain unsatisfactory, the question of recourse to

hypnotics requires to be considered. Obviously, it is better they should be done without if possible, but their disadvantages are more than counterbalanced by the restoration of energy provided by some hours of sleep. The assistance of suitable drugs, wisely selected, and not pushed to the extent of establishing a "habit," is so helpful that preconceived notions should not be allowed to prohibit their administration. Whatever hypnotic be chosen, the best results are obtained by giving it for three or four nights in succession rather than by leaving it to the patient's judgement to take as he pleases. By anticipating the risk of a bad night, the evil habit of broken sleep may be frequently escaped. The bromides are the simplest and least objectionable of all sedative drugs. They ought to be administered in full doses of 30 grains, and their efficacy will be much enhanced by combination with small doses of chloral hydrate. The latter drug has been handicapped by an unfortunate reputation for a dangerous influence upon the cardiac centres. This danger, if it exists at all except when the drug is exhibited in large doses, is grossly exaggerated, and may be disregarded altogether when the heart is sound. Ten grains given in combination with 30 grains of the bromide of sodium or potassium will be found efficacious in a large number of cases. The combination ought to be given half an hour before bedtime, and it may be repeated safely after two hours if the initial dose fails to produce the required effect.

When this fails, a trial may be made of bromidia in drachm doses, of chloralamide in 30 grain doses, or of chloralose in 6 grain doses; all of which are variants of chloral in combination. There are other alternatives to choose from; one of the following may be selected and administered in the form of a cachet:

Medinal	...	...	...	in 7 gr. doses; or
Trional	...	...	...	in 15 gr. " or
Sulphonal	...	...	...	in 20 gr. " or
Adalin...	...	...	...	in 10 gr. " or
Chloretone	...	...	...	in 15 gr. " or
Bromural	...	...	...	in 10 gr. "

Paraldehyde is valuable and should not be lost sight of, but it is a nauseous drug, and leaves such an unpleasant and tell-tale odour in the breath that it is not desirable except in cases where there is mental excitement and extreme restlessness. In these circumstances arises also the question of morphine and atropine, and there can be no doubt that one-quarter of a grain of the former with one-hundredth of a grain of the latter, given hypodermically for a limited number of doses, often saves the situation where milder remedies fail in their effect. This combination is specially indicated in cases where pain, from whatever source, contributes to the sleepless nights. Just as in the case of chloral, so in that of morphine, the spectre of evil after-effects or the possible creation of a drug habit cause it to be withheld in many instances in which its beneficent effect far outweighs any theoretic fear of evil consequences. Its abuse is no argument against its legitimate use, and of all the remedies we possess against the hopeless misery of insomnia to which nothing else has brought relief, it is a stand-by whose reliability and potency may always be depended upon. Combination with atropine increases its efficacy, and minimizes some of its penalties. It often happens with hypnotics, as with so many other drugs, that a combination of two or more is productive of happier results than the administration of any one by itself. There is space only to mention a few such combinations that answer well:

- Fifteen grains of trional with half a grain of codeia.
- Twenty grains of chloralamide with thirty grains of potassium bromide.
- Ten grains of aspirin with seven grains of Dover's powder.
- Ten grains of bromural with one-sixth of a grain of morphine.
- Five grains of zinc valerianate with one eighth of a grain of heroin.

In cases in which there is a persistent high-tension pulse dependent upon sclerotic changes in the arteries, and the patient gets to sleep on first going to bed, but wakes within two hours, nitro-glycerine is of inestimable value. A tabloid containing 1 minim of the 1 per cent. solution of the drug put into the cheek the last thing at night and left to melt there gradually, often prevents increase of tension after getting to sleep, and may be safely repeated should the patient awake during the morning hours.

Electricity is said to be sometimes useful as a sedative agent, but its effects are uncertain and may prove to be exciting rather than soothing. Hypnotism also has its advocates, but, though possibly useful in carefully selected cases, it cannot be regarded as other than a doubtful and experimental remedy.

Finally, it is well to recognize the value of philosophy as a hypnotic. Submission to the inevitable and a cheerful acceptance of the duties and bothers of every day will go far to promote the likelihood of good sleep at night. The prayer of R. L. Stevenson is worth remembering:

The day returns and brings us the petty round of irritating concerns and duties. Help us to play the man; help us to perform them with laughter and kind faces, let cheerfulness abound with industry. Give us to go blithely on our business all this day, bring us to our resting beds weary and content and undishonoured, and grant us in the end the gift of sleep. Amen.

THE "BUFFER-SALTS" OF THE BLOOD.

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WHILE I quite agree with Dr. Benjamin Moore (June 29th, p. 720) that the expression "buffer-salts," as applied to the constituents of the blood plasma, is undesirable and misleading, I am unable to share his views as to the reason why it is so. In the first place, the name "buffer" does not suggest the correct interpretation of the way in which these substances do their work. Their action is rather to soak up, as it were, an excess of hydrogen—or hydroxyl—ions by the formation of compounds which are much less dissociated electrolytically than the acids or alkalis added. The word arises from a mistranslation of the original word, "*tampon*." I owe some apology to the readers of this JOURNAL for calling attention to some points which I have already discussed elsewhere, especially in my *General Physiology*, but I hope that some purpose may be served by bringing them together in this place.

Dr. Moore's account of the history of the name "buffer-salts" is not quite complete. Its origin is to be found in a paper by Fernbach and Hubert, published in the *Comptes rendus* of the French Academy in 1900 (vol. cxxxi, p. 293), where *tampon* is used to express the soaking up of hydrogen ions by such salts as sodium bicarbonate. The fact itself is most clearly seen with this salt, and the whole mechanism of its action, together with the similar action of the phosphates, has been explained in detail by Lawrence Henderson in a series of articles in the *American Journal of Physiology*, commencing in vol. xv in 1906. The complete discussion is given in vol. xxi, p. 427. To put the matter briefly, although somewhat incompletely: when an acid which is stronger than carbonic acid, such as lactic acid, which is dissociated with the production of a large percentage of hydrogen ions, passes into the blood, it combines with a part of the bicarbonate contained in the plasma, forming sodium lactate, and is therefore neutralized. At the same time, carbon dioxide is driven off and escapes by the lungs. But, even if it did not escape, there could be only an unimportant rise in the hydrogen ion concentration, because carbonic acid is an extremely weak acid and is scarcely dissociated at all.

To return to the word *tampon*. The original meaning of the name, which is probably that which the French writers had in mind, is that of a plug of cotton-wool pressed into a wound or elsewhere in order to stop bleeding. It has come later to be used for a railway buffer. It is, in either case, not quite the right word for the case we are dealing with. What we want is something to suggest the use of a mop or swab to absorb blood or exudation, not to stop haemorrhage by pressure. The name *tampon*, however, was used by Sørensen in a long series of researches (*Études enzymatiques*), published in French in the reports of the Carlsberg Laboratory at Copenhagen. It will be found on p. 19 of the eighth volume (1909). This work was also translated into German, and will be found in the *Biochem. Zeitsch.*, vol. xxi; on page 149 of this paper the word *tampon* is translated "Puffer," and hence got into English as "buffer," a quite inappropriate word. The buffer absorbs the energy of the moving train, not the train itself.