three months, by which time he will reach Group I, and after going through the process of hardening will be fit to be transferred to army category A, B, or C.

Dr. Lambert considers that the system of convalescent camps and command dépôts is working very well, that massage is well and intelligently administered, and that the system of training by medical gymnasts is preferable to the use of Zander or other forms of mechanical apparatus.

Finally, it is to be noted that the number of men passed through and restored to health is very large; the number undergoing massage, electricity, and special exercise treatment in the command dépôts at one date in September was 8,262, and the total number of men who had then passed through the dépôts was 127,132.

THE ALLEGED PERILS OF URIC ACID.

BY

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THE public are, through the medium of the daily press, persistently reminded of the perils to which they are exposed from uric acid, but are at the same time confidently promised a safe escape from their dangers by the use of the remedies which the enterprising dealers recommend for that purpose. As all this is merely the usual exploitation of medical opinions which are still unsettled, it is advisable, therefore, to review briefly the alleged facts upon which it is based.

When deposits of uric acid were detected in the joints which had previously been the seats of painful inflammatory swellings, that substance was at once assumed to be the cause of gout; and not only of the typical and so-called regular manifestations of that disease, but also of all functional derangements and anatomical lesions which precede, accompany, and follow that peculiar affection of the joints. This view has gained general and speedy acceptance owing to a favourable concurrence of circumstances. There was the belief, which for centuries has been held—a belief so implicit that from its inception to this day it has never been questioned—that gout is essentially the consequence of excesses in eating and drinking, or of indulgence in particular articles of diet; and as uric acid was supposed to be an imperfect form of urea there was *prima facie* evidence of its causality. Not the less influential was the disappointment of practitioners who had long since turned away from the wranglings of the humoralists and solidists. Neither the shadowy product of a faulty distillation nor the mysterious influence of the nervous system could satisfy their longing after a clearer insight into the nature of the process with which they had to deal. The remedial measures, which they could plan only upon some speculative opinion, persistently failed. Their failures were disheartening to everybody concerned, and continued to be the subject of general derision as they had been at the time of the Satirists of old. But now there was a prospect of a change for the better. Here was a definite chemical body which as a derivative from food not only confirmed a doctrine held from the remotest antiquity, but encouraged the hope that if its formation could not altogether be avoided its consequences might at least be effectually averted.

Uric acid was thus with one accord admitted as the specific cause of gout; and though recently other substances have been suggested instead of it, it has hitherto lost none of the hold which it had gained at the moment of its discovery as a constituent of tophaceous deposits.

Nothing, however, was known how that peculiar substance obtained and how it exerted its alleged morbid action, for though presumably a toxic agent by virtue of its being an excrementitious substance, it was impossible to overlook the fact that it was invariably formed in the course of normal metabolism, and generally discharged without producing any disturbance. It was obvious therefore that there were here peculiar circumstances which led to its conversion into an irritant and to its deposition into the joints.

The fundamental doctrine supplied the key to the solution of the problem. Excesses in eating and drinking, it was argued, being the primary cause of the disease, it

followed that their product would be correspondingly large, and such a mass of effete matter would be enough to account for all the symptoms of gout. Thus the uric acid would contaminate the blood; and if it happened, as it often did, that other acids were generated within or introduced from without, they would render it insoluble. To avert the serious consequences that would ensue from the presence of that impurity the system made efforts to get rid of it, and in favourable circumstances succeeded in doing so by depositing it into the articular cartilages as being parts of no great importance for the preservation of life.

Since this theory was advanced it has been found that uric acid is derived not only from food, but also from the disintegration of the nuclei of the tissues. Whether its origin is endogenous or exogenous, even the largest quantities that may be formed are excreted without any concomitant derangement so long as the renal filter is intact, and whatever the disturbances associated with its imperfect elimination they are not produced by it. All the symptoms that occur in these circumstances are co-ordinate phenomena, and are due to some pathological changes in the kidneys which lead to a retention not only of uric acid but also of urea, of water, and of other effete substances. That such retention is not indifferent to the organism need hardly be insisted upon, but that uric acid is the sole, or even the most potent, element in the causation of the ensuing consequences is a purely gratuitous assumption.

Nothing has been definitely ascertained on this subject, although an over-production of uric acid in gout has been readily assumed. The current view on that point is merely an inference from the fundamental doctrine upon which the pathology of the disease has been constructed. Brugsch, however, holds as the result of his researches that uric acid is formed here in an abnormally small quantity—so small, indeed, that the presumably healthy kidneys are not sufficiently stimulated thereby to effect its removal. He alleges that it is retained in the blood and allowed gradually to accumulate there until it has reached an amount sufficient to break the renal barrier.

Nor is there the slightest evidence of any deficiency of alkalis in the blood, whereby uric acid is rendered insoluble, and thus becomes an impurity of which the organism can only rid itself by depositing it into the joints. Numerous hypotheses have been advanced to account for this supposed conversion, but none of them has been confirmed by actual examination. All inquiries into this subject have shown that there is no deficiency of alkalis, and that uric acid is perfectly soluble even in blood which is saturated with it. The statement of one writer that in his own case he felt, on the consumption of a few drops of an acid, the uric acid immediately rushing into his big toe, stands hitherto as an isolated experience.

Just as there is no foundation for the assumption of the several stages previously referred to which are said to lead ultimately to a deposition of urates, so there is none for the hypothesis that they, in the form of crystals, exert pathogenic influence. Whether they act in the typical attack of gout as mechanical irritants, as some maintain, or as toxic agents, as others hold—in either case it would be necessary that, being the alleged causes, their presence must precede the appearance of their consequences. But though the process takes place in the closed cavity of the joint, and is thus not accessible to direct inspection, yet the conclusion is fully justified that it is not different from what is observable on the surface. Thus Sir Alfred Garrod described the formation of an inflammatory tophus of the ear as starting with a vesicle of clear contents, in which the microscope showed a few uratic crystals. Gradually, when the serum was absorbed, the exudation became inspissated and opaque, the uratic crystals were then more numerous, and when all the fluid was removed the tophus remained. When there is occasion to examine such a tophus anatomically it will be found that there were initial changes either in the subcutaneous tissues or in the cartilage of the ear, or in both.

Not infrequently, however, urates are found on *post-mortem* examination of joints, in which their deposition was never attended by inflammatory or other symptoms, notwithstanding Sir Alfred Garrod's opinion that this cannot take place without producing some twinges. Commonly tophi of very large size are formed on the fingers without the least sign of any inflammatory

reaction, which appears only when the matrix in which the urates are deposited has begun to soften.

But as the term "gout" is generally used, both in theory and in practice, it is applied to all kinds of functional derangements and organic lesions, which are then described as visceral or irregular gout, and are supposed to be due to uric acid in the blood. Oftener than not that substance is not then found where it is supposed to exist. If it happens to be present, there is not the least evidence that any of those symptoms are produced by it, as it is met with in the ascitic, the pericardial, and the pleuritic effusions in connexion with such various diseases as valvular lesions of the heart, tuberculosis of the lungs, the pleura, and the peritoneum, with or without amyloid degeneration of the kidneys or the spleen; in acute pneumonia, in cirrhosis of the lungs and in pneumothorax; in marasmus due to stenosis of the pylorus due to a cicatrix of a gastric ulcer; in cirrhosis and cancer of the liver; in chronic interstitial and chronic parenchymatous nephritis; in amyloid degeneration of the kidneys; in pernicious anaemia; in chronic lead poisoning; in the contents of ovarian cysts; in hydrocele fluid, and in the ichor of gangrene of the lower extremities. On the inflamed or obsolete tissues, into which such transudations or effusions may have taken place, the uric acid may crystallize out of its solutions, and generally does so with the receding tide, but no one will seriously maintain that it is the cause of those various lesions. Uric crystals never occur in the circulating fluid; their deposition is an epiphenomenon, and is observed only in joints in which the cartilage was inflamed or has undergone amyloid degeneration or other changes; in the tissues of a degenerating cutaneous tophus; upon an atheromatous intima of the aorta; upon inflamed meninges; upon ulcers of the rectal mucous membrane, and within the corpora cavernosa of the penis, if they contain decayed or decaying matter.

Thus the clinical data afford no proof whatever of any pathogenic property of uric acid. Nor do the results of experimental inquiries. Subcutaneous injections of that substance into rabbits, and occasionally into guinea-pigs and dogs, have in no case produced a gouty inflammation of a joint or a tendon; they have led merely to deposits in the skin outwardly resembling tophi; but even that effect was obtained only by quantities thirty times as large as occur in man. Van Loghem introduced uratic crystals into the peritoneum of animals, and with the exception of a slight exudation of leucocytes, as may well be expected from the presence of such foreign bodies, he saw no deposits of crystals in the liver nor inflammatory reaction of its tissue. Leber, therefore, holds that only in considerable concentration does uric acid exhibit a very slight tendency to cause inflammation. Ibrahim, on the other hand, injected into himself a solution of 6 grains of uric acid with 9 grains of piperazin in 2 oz. of distilled water. The injection was very painful at the time, and continued to be so for hours or days; but the tissues, though hard and infiltrated, showed no sign of any nutritive changes. Freundweiler, however, alleges that he produced tophi which became inflamed; if so, these results are different from what takes place in the human subject, in whom the tophi generally remain an inert mass until the matrix softens. Whether he carried out his experiments with all necessary precautions does not appear from his reports of them.

In view of these facts, many clinical observers deny the causality of uric acid in gout and hold that the materies morbi is here a particular poison the nature of which is unknown. They make this unwarranted assumption because they hold that the gouty process takes place in previously healthy tissues.

There is consequently no indication for an exhibition of a uric acid solvent, because that substance is readily soluble in the tissue juices and is not the cause of the symptoms observed. Even if those alleged solvents served to remove all the uric acid from the blood, even then the patient would not be benefited thereby; for in the experience of His an intense treatment with radium completely drove out all uric acid from the blood, yet the gouty attacks returned with the same frequency and the same intensity as before. Moreover, such of the alleged solvents of uric acid which contain salts of soda have the undesirable consequence of favouring a deposition of uratic crystals.

Not only is the use of the pretended remedies to cure

the various functional derangements and organic lesions which are wrongly attributed to uric acid recommended upon a baseless hypothesis, but it is mischievous also, because it allures the unwary sufferer by specious advertisements of its effectiveness to have recourse to it and continue with it until its failure is evident. Thus valuable time is lost before he submits himself to rational treatment while there is still a reasonable prospect of satisfactorily coping with his disease.

ACETOZONE AS A GENERAL SURGICAL ANTISEPTIC.

BY

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The important properties of an ideal antiseptic appear to be (vide Browning and others, BRITISH MEDICAL JOURNAL, January 20th, 1917) that it has (1) great potency against all micro-organisms in presence of protein material, as serum, etc.; no deleterious effect on phagocytosis; (3) is innocuous to the tissues; has (4) a stimulating effect on connective tissue cells, so that it promotes healthy granulations; and is not toxic.

In benzoyl-acetyl-peroxide we have a preparation that fulfils these conditions. After previous experience of this substance in my surgical wards, I introduced it into this country in May, 1915, and have used it extensively in military hospitals since then as an antiseptic solution in the treatment of septic wounds. Its formula is $C_6H_5CO.O.COCH_3$, and it is known as acetozone. It has been used for years as an intestinal antiseptic in enteric fever and mucous colitis, and as a throat spray.

It may be used cold as a bath: (a) containing 5 grains to the pint (the cost is 8d. a gallon at army prices, and plenty of it is available); (b) or as a 7-grain solution with one-third hot water added. Its action is very rapid; unhealed amputation stumps heal quickly if put into a bath of this solution for half an hour daily, and dressed afterwards with dressings of sterile lint or gauze soaked in the 10-grain solution.

I have seen numerous cases of septic wounds which have resisted all other treatment for four or five months heal up in three weeks by this method.

It can be applied to deep wounds by Carrel-Dakin tubes, by the bath method, or in a waterproof bag, or by wet dressings of 10 grain strength solution, renewed two or three times a day.

Mode of Preparation.

1. The solution must be made by adding 5 to 7 grains to 1 pint sterile water at 112° F., left to stand for two hours, and should not be filtered.

2. Or a 10-grain to 1 pint solution can be used with dressings or Carrel-Dakin tubes, etc.

3. In very septic cases, swarming with anaerobes, etc., a 20-grain to 60-grain solution may be used.

4. It should be made fresh every seven days, and the bottle shaken before using.

Pure hydrogen peroxide is very unstable and momentary in its oxidizing power, while acetozone in solution is a fairly stable antiseptic, and its ozone-producing power is prolonged. Acetozone has a remarkably pleasant, pungent ozonic odour, the solution is colourless, and does not stain linen. Used in a 20-grain solution it is an efficient sterilizer of the skin.

Professor Hewlett has made bacteriological experiments with this drug, and reports as follows:

REPORT ON TESTS OF THE GERMICIDAL POWER OF ACETOZONE.

By PROFESSOR HEWLETT.

At the request of Lieut.-Colonel Gore-Gillon, R.A.M.C., we have carried out a number of tests on the germicidal power of acetozone (benzoyl-acetyl-peroxide). The tests have been done with the *Staphylococcus pyogenes aureus*