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ON THE PHOSPHATE OF AMMONIA, AND ITS VALUE IN THE TREATMENT OF GOUT AND RHEUMATISM.

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(Read at the Quarterly Meeting of the Bath and Bristol Branch of the Provincial Medical and Surgical Association, held at Bath, September 30, 1847.)

The obstinate and sometimes intractable nature of gout and rheumatism, and the fact of the almost innumerable remedies that have been from time to time introduced to notice, and subsequently found incapable of producing any decided or uniform mitigation of their symptoms, will be sufficient to justify me in making a few remarks upon the very beneficial effects of a salt, which, as far as I know, has been little or never in this country applied to the relief of gout and rheumatism, or in fact, generally employed as a therapeutic agent. Some years since, I was informed by an American friend, that he had seen the phosphate of ammonia prescribed occasionally in those diseases, and with unquestionably good results; I therefore determined, when opportunity presented, to put this medicine to the test of experience, which I have now done to a considerable extent, and with a degree of success (especially in those cases afterwards to be pointed out,) which I did not in the least anticipate, and which induces me to lay the following remarks before you, and I take this opportunity of expressing a hope, that should any be influenced to make a trial of the remedy, they will communicate the results of their experience.

The phosphate of ammonia, as I said before, has never, in this country, been applied generally to therapeutic purposes. In the standard works on *Materia Medica*, no mention is made of it at all. Dr. A. T. Thomson states that the only medicinal substances which contain phosphorus, are the quaternary compounds, phosphate of soda, and phosphate of lime.* Pereira and other authorities to whom I have referred, being equally silent upon this salt, I subjoin a description of it as occurs in Brande's "Manual of Chemistry," being an epitome of the researches of Mitscherlich upon it. "Phosphate of ammonia (p' + a)—The

mutual action of anhydrous phosphoric acid and ammonia has not been studied: they probably give rise to *amide*. The neutral phosphate of ammonia may be obtained pure by saturating phosphoric acid with ammonia or carbonate of ammonia, and carefully evaporating, so as to avoid the production of an acid salt. It may also be formed by adding carbonate of ammonia to the acid phosphate of lime, obtained from bone earth, till no further effervescence or precipitate of phosphate of lime follows, filtering and evaporating, taking care, however, to leave slight excess of ammonia: the solution left to itself deposits the salt. Its primary form is an oblique rhombic prism, the smaller angle of which is $84^{\circ} 30'$. Its prisms are often terminated by diedral summits." (Mitscherlich, *Ann. de Chim. et Phys.*, xix. 382.) The salt is soluble in four parts of cold water; when heated it melts, and losing ammonia, leaves hydrated phosphoric acid. It exists in the urine of carnivorous animals. This salt has not been accurately analysed, but it probably consists of—

Ammonia	-	1	17.	25.57
Phosphoric Acid	-	1	36.	54.13
Water	-	$1\frac{1}{2}$	13.5	20.30

Phosphate of Ammonia 1 65.5 100.00

There is also a biphosphate which I have, however, not used: its crystals are not so soluble as the above, not acted upon by the air, and consist of one equivalent of ammonia, two of acid, and three of water. The primary form of this crystal "is an octohedron, with a square base; but the right square prism terminated by the faces of the primary form is the most frequent."*

The taste of the phosphate of ammonia is cool, saline, and somewhat urinous: hot water dissolves scarcely more than cold. It is deliquescent. According to Berzelius it exists in healthy human urine in the proportion of 1.65 in every 1000 parts. I have, however, found it far more abundant than this after urine becomes putrid. This salt has long been used in the arts as a good flux for assays and the blowpipe; it is used also in the manufacture of artificial gems, and of stained glass. Some years ago Gay Lussac recommended muslins and articles of that kind to be immersed in a solution of equal parts of this salt and of hydrochlorate of ammonia, as it was found to a

* Dr. A. T. Thomson's "Materia Medica and Therapeutics," p. 101.

considerable extent to render them incombustible. Muslins thus treated, after being dried, were burned with difficulty, and could not be consumed with flame, in consequence as he supposed of the prevention of the access of oxygen by the glazing which the salts form at high temperatures.

When taken internally, in the dose of ten to fifteen grains, (that which I have ordinarily given,) it produces no great sensible physiological effects; from fifteen to twenty minutes after, it occasions a slight feeling of nausea, accompanied with heat at the epigastrium, immediately after which, if the surface be kept warm, either by additional clothing or exercise, it acts as a somewhat powerful stimulating diaphoretic. I have also several times seen it act as a diuretic; and in two cases in the dose of ten grains, it has had an aperient action; but both these being females with highly irritable mucous membranes, the latter must not be considered, I conceive, as any ordinary physiological effect. When administered in cases where uric acid exists in increased quantity in the system, and is deposited in the urine, either pure or combined, such as peculiarly exists in gout and rheumatism, it speedily reduces the amount. This fact I have repeatedly ascertained, both chemically and microscopically, and in many cases it has received the confirmation of my friend Mr. Bartrum, who was wholly at first unaware of my motive in begging his examination of the specimens.

Since employing this remedy, I find that Dr. Buckler, of Baltimore, (U.S.) has also employed this salt in these diseases, and with great success. He asserts he was led to believe that these diseases were produced by lithic acid, existing as an insoluble compound with lime or soda, thereby preventing elimination of it by the skin or kidneys. The phosphate of ammonia, by decomposing those lithates, and forming soluble salts, would thus tend to the subsidence of the affections in question. Two other American physicians have written upon it, in whose practice it was attended with no good results,—the one, Dr. Reuchtenbacher, who disbelieves in its efficacy; the other, Dr. Voight, who goes so far as to say that it is a hazardous medicine, and that he has seen three grains produce dangerous symptoms.* It is, however, extremely doubtful in my mind if these dangerous symptoms had anything to do with the salt at all, as Dr. Buckler, it appears, mentions nothing of the kind; and now, after having employed it for a twelvemonth at the Eastern Dispensary of this city, in a large number of cases of various kinds, and other friends at my suggestion having employed it too, I feel myself correct in asserting that it has never given rise to any disagreeable symptom, but on the contrary, with some two or three exceptions, has acted always with remedial effect.

It is not my intention, nor would it be altogether becoming in me, before you, to enter into very minute particulars relative to the opinions of various individuals, as to the proximate cause of gout and rheumatism, but I feel it necessary to make a few remarks upon this subject, so as clearly to understand how the remedy under consideration, as I conceive, acts upon the system at large. I have for three or four years had these diseases associated in my mind with such a disordered assimilation, primary and secondary, as would lead to the production of a large and undue deposition of lithic acid, or its compounds, in the system, occasioning such an extent of acrimony in the fluids of the body, as to irritate and excite to a morbid action, the lymphatics and minute terminations of the arteries, in the several parts of the body, and not improbably of the lining membrane of the larger arteries, becoming in fact a source of irritation wherever deposited, more especially in parts, such as the joints and sheaths of the ligaments and tendons, which, being inextensible, would sooner probably become affected by such distempered excitability. If such a view were correct, we shall see that many writers on this subject have been correct, but only partially so; thus, Jeans and Sutton believed that the alimentary function was deranged; Wallis, the nervous system; Latham, that the lymphatics were obstructed; and Kinglake, that the ligaments were inflamed. Long ago Parkinson considered the blood to be at fault, and that the disease depended upon a peculiar saline acrimony existing in it. With regard to gout, at the latter end of the last century, Mr. Murray Forbes declared his conviction of the lithic acid being the cause of the disease. Sir Charles Scudamore, in his work on gout, does not point out what he considers the exact proximate cause, but comes to this conclusion, that "gout is a disease depending upon a redundancy of blood, with relation to the powers of the circulation, particularly affecting the system of the vena portarum, and the consequent functions of the liver, together with the production of a morbid change in the secreted products of the alimentary canal in general, and of the kidneys in particular."

I can conceive the question occurring to your minds, how is it that gout and rheumatism should not exist in all those acute inflammatory diseases, especially affecting those organs that influence the circulation, where we know that uric acid is found in abundance in the system? In reply to this I can only answer, that the same peculiar disposition existing in the body will account for it as, we must suppose, accounts for the facts, that the gout affects the hand in females more frequently than in males; that the children of gouty parents may suffer, one from scrofula, another from asthma, and a third from gout, of which I know an instance; or, that "in the same family, the males are known usually to present the well-marked symptoms

* *Vide* Ranking's "Abstract," vol. iv., July to December, 1845.

of external gout; while in the females, various symptoms of disorder of the brain, the heart, or the kidneys, usually appear;* or lastly, that the same medicine introduced into the system should act in a different way upon different individuals, for instance, mercury, ipecacuanha, &c.

From much observation of gout and rheumatism, so many points do I see of analogy between these diseases, that I am inclined to view them with Barthez, Chomel, and others, as only varieties of the same disease. I believe with them, it is almost futile to attempt a diagnosis beyond marking the parts affected in each; and even this is anything but diagnostic, for most practical men will agree with the observation of Dr. Todd, who says, "Gout shews, at first, a decided predilection for the small joints—those of the hand and foot, but in time all the articulations are obnoxious to it; and not only they, but also tendons, ligaments, bursæ, and synovial sheaths."† Most will allow that the one often passes into the other, and that such an extreme resemblance occasionally exists between them, that the term rheumatic gout is not unaptly given, especially if we accept the views of Prout relative to these diseases, who says, "When the lithic and lactic acids are developed together, as they may be and often are, the phenomenon may be supposed to show that the mal-assimilation involves both the gelatinous and albuminous textures; and that the accompanying disease partakes of a mixed character, or in fact constitutes what is not improperly termed *rheumatic gout*."‡ Professor Liebig, however, has called in question the existence of lactic acid at all, and from his enquiries it would appear, that Berzelius mistook it for that singular substance discovered lately by Pettenkofer, which abounds in azote, and is stated to be in the proportion of five grains in every 1000 grains of urine. Dr. Bird remarks, "Its formula differs only in the proportions of the elements of water from that of uramil, a product of the decomposition of uric acid, and which may be regarded as uric acid in which the elements of urea are replaced by those of ammonia and water. Is it possible that this new body, is a transition formation between uric acid and urea?"§

Dr. Prout seems to have arrived at the conclusion that these diseases are so associated with the existence of these acids, that "they may be regarded as *somewhat* in the light of *materies morborum*; or, strictly speaking, the undue presence of these acids in the urine or elsewhere, under certain circumstances, may be viewed as indices of the existence of certain diseased actions going on in the primary tissues of the body; and which are known by the names of gout and rheumatism." From my enquiries and observations, however, I am, with deference, inclined to view both

diseases as caused by this superabundance of uric acid, either pure or combined, in the system, occasioned chiefly by disordered action in the assimilating processes, for I believe "the elements of the acid and its combinations are in these diseases supplied both by the nitrogenized elements of the food, as well as by the changing tissues of the body,"* thereby occasioning the morbid actions above alluded to. Contingent circumstances of age, hereditary disposition and the like, decide whether the symptoms will be those which are most frequently referred to gout or to rheumatism; at the same time my observations lead me to consider that the latter is more frequently associated with uric acid in the system pure, the former combined with soda or lime. This is strengthened by the fact that in gout the liver is greatly more deficient in its action, by which means probably a deficient elimination of soda from the blood occurs, which, uniting with the lithic acid in the system, produced in the secondary assimilating process, accounts for the characteristic gouty concretions. I may remark, in confirmation of that which has been advanced relative to disordered primary assimilation, that all authors and observers agree in stating that the functions of digestion and the hepatic and urinary secretions, are deranged prior to the appearance of both diseases, more especially of gout and the sub-acute form of rheumatism.

It is well known and not doubted by most physicians, that by proper dietetic measures, the gouty disposition may be prevented from being engendered. The hereditary disposition or transmission, if it really exists, according to Sir Charles Scudamore, and Dr. Mackintosh, does not in the majority of instances, as some suppose, go to prove the existence of a "peculiar matter," but only, as I conceive, of a certain diathesis or conformation in the system. With regard to hereditary rheumatic diathesis, proofs are wanting that it really exists. Chomel, however, states that out of seventy-two cases, thirty-six were born of rheumatic parents. It is well known that neither diet nor exercise is beneficial or curative in gout or chronic rheumatism, without the alimentary canal, and the cutaneous, and urinary secretions are in a state of health; but as they (diet and exercise,) tend to the improvement of these secretions, they become indirectly curative. Sir George Baker records a case in point, of the late Mr. Wood, in the "Transactions of the Royal College of Physicians," perhaps remembered by most, who, after living freely on fat meats, butter, cheese, ale, &c., became exceedingly corpulent, began then to suffer heartburn, sickness, constant thirst, pains in the bowels, headache, giddiness, and other symptoms of disordered digestion; then came on violent rheumatism and afterwards frequent attacks of gout. Under medical care and rigid abstinence, the dyspeptic symptoms forsook him, and finally, the gout and rheumatism. Dr. Mackintosh states, in

* Craigie's "Practice of Physic."

† Todd "On Gout and Rheumatism."

‡ Prout "On Urinary Diseases."

§ Bird "On Urinary Deposits."

* Idem.

speaking of acute rheumatism, "It is of the utmost consequence to regulate the diet, as relapses may frequently be traced to indigestible articles of food."* Dr. Todd also remarks, "the slightest irregularity of diet is speedily felt, and quickly aggravates the symptoms." An acid condition of the stomach, of the blood, and of the secretions, is generally found in gout and rheumatism. Berthollet has shown that the skin in gouty inflammation secretes a fluid which extensively reddens litmus paper, and the acid sweat of rheumatism is familiar to all.

That these diseases are connected with morbid matter circulating in the blood, has been ably advocated by Dr. Todd, and this peculiar matter, whatever may be its nature, he believes is formed in the primary and secondary assimilating processes, thereby occasioning a disturbance of longer or shorter duration, of greater or lesser intensity, in the nutrition of parts to which it is attracted. His arguments on these points are valuable, and will well repay careful perusal. I regret time will not allow me to enter upon them here, but he considers it "impossible to explain the phenomena of gout upon any other hypothesis than that which supposes the existence of a peculiar matter in the blood;" and in reference to rheumatism he remarks, "in this disease, general nutrition is disturbed, not by mere local disease, nor by any impression on the nervous system, but by the development of a morbid matter in the blood, which visits every part to which that fluid is distributed, but which is attracted by some textures much more than by others."

With respect to the similarity of the two diseases, Heberden (whose description of the diagnosis between them is unquestionably the best,) states, (and all I think, will allow it,) "that young children may suffer from violent rheumatism, especially those who, from an inherited diathesis, will suffer from gout when they arrive at manhood;" and Dr. Todd remarks, that "the children of gouty parents are more liable to this disease, (rheumatism,) than those who have sprung from an untainted source." He goes so far as to say, that the remarkable resemblance, however, between the same diseases, may justify our concluding, that a certain similarity of composition may exist between the morbid matter of each. The former celebrated author also asserts, that there are cases frequently met with where the distinctive peculiarities of the two diseases are so blended that it is impossible to say whether the pains belong to gout or rheumatism.†

The secretion of urate of soda is not confined to gout alone, for Dr. Macleod has shewn that in capsular rheumatism the articular cartilages are seen covered with it. It has also been asserted in diagnosis, that gout is not preceded or accompanied with symptoms of fever. The most accurate observers state the contrary. Dr.

Craigie observes, "The patient, if he has not previously been chill, feels cold, and has transitory chilliness, which sensations, however, are speedily followed by heat, thirst, restlessness, and other symptoms of fever." Dr. Mackintosh says, that "the pulse is generally full and hard, and indicates an inflammatory and plethoric state of the system."

The connection between the diseases under consideration and disorder of the urinary system, especially of the lithic acid form and its compounds, has been observed by most, especially Sydenham, Musgrave, Whytt, Murray, Wollaston, Sir Everard Home, and more recent writers, such as Prout, Simon, Bird, and Todd. The latter says, the *gouty diathesis* "is often little more than an aggravated lithic acid diathesis. The lithate of ammonia or even lithic acid in a free state is frequent," and in rheumatism "the urine is scanty, strongly acid, and deposits an abundant sediment, consisting of lithates and purpurates of ammonia; its specific gravity is high, the quantity of lithic acid is increased." With regard to gout, it is often so associated with the urinary disorder, that it is a fact well known, that often when the latter is diminished, the former is aggravated, and *vice versa*. All must have seen a severe attack of rheumatism sometimes pass away after existing a few hours or days, on a copious sediment of lithic acid appearing in the urine. A singular fact connected with the occurrence of rheumatism in a disease where the positive and relative proportions of the ingredients of the urine are greatly diminished, is seen in granular disease of the kidneys, where the patient so affected, if exposed, is peculiarly subject to rheumatic attacks.

Dr. Prout remarks, "*chronic* rheumatism, I have observed, with Dr. Christison, to be a common and very troublesome concomitant of renal affections;" and in reference to the deficiency in the urine just referred to in renal granular degeneration, says, "with respect to the relative proportions of the ingredients, according to my observations in such cases, the *lithates* are most strikingly deficient."* Rayer observes, that the solid matters of the urine in this disease are diminished in quantity, and are found to exist in the blood and serous effusions. Dr. Bird also remarks, "in the two allied affections, gout and rheumatism, exclusive of the many neuralgic diseases popularly referred to the latter, a remarkable tendency to the formation of an excess of uric acid, both pure and combined, occurs. The elements of the acid or its combinations are in these diseases supplied both by the nitrogenized elements of the food, as well as by the changing tissues of the body." As is well known, the urine is always high coloured, extremely acid in both diseases, and voided frequently with pain and scalding. The effect of the irritating qualities of the urine in gout has been known to produce all the symptoms of gonorrhœa, scalding.

* Mackintosh's "Practice of Physic," vol. ij., 501.

† Essays, Physical and Literary, vol. iii;

• Prout, "On Stomach and Urinary Diseases."

discharge, &c.: such has been commented upon by Stoll and Dr. Clerk.* Its density is high, generally between 1.018 and 1.035. The sediment deposited usually consists of the lithates, and with pure lithic acid, a trace of the phosphates and urea mixed in various proportions; and it is to be observed, as Dr. Craigie states, this deposit is not confined to the close or subsidence of the febrile symptoms, though at that time it is more abundant. In nineteen cases of acute and sub-acute rheumatism which I have carefully noted, seventeen threw down a copious sediment of uric acid, on the addition of muriatic acid." Simon writes, "in acute rheumatism the urine is sometimes purple red, its acid re-action strongly developed and bulky with fawn-coloured deposits of crystallized uric acid and urate of ammonia. In eighteen cases which Becquerel examined, the urine he found generally precipitable with acid. Out of thirty-seven cases of chronic rheumatism, the same observer found the urine in seventeen assume the inflammatory type. The lithate of soda concretions exist sometimes in almost every part of the body; they have been found extensively in the calyces of the kidneys, as also upon the skin. Dr. Bird narrates a case of rheumatic gout, where the legs, which were affected with eczematous eruption, were frosted with microscopic crystals of urate of ammonia.† One or two writers state that they have found lithate of soda in the deposits that occur in arteries and on the valves of the heart; and Dr. Todd asks, whether they may not frequently be of the gouty kind? Mackintosh, in referring to gout, makes the following (for the theory,) apt remark:—"It is the universal belief of those who have either seen the disease or experienced its sufferings, that a gouty paroxysm clears the system of something which had been acting injuriously upon it for some time.‡"

Sufficient has been said, I deem, to make it apparent that the diseases now under consideration are intimately connected with a superabundant formation of uric acid and its compounds, especially urate of soda, in the system, and I cannot but believe it acts as an exciting cause, showing its results in attacks of gout and rheumatism. If such be true, the physiology of the beneficial action of the phosphate of ammonia is simple when we recollect that this excess of uric acid, which every one allows to exist in these diseases, is, according to Dr. Bird's opinion, first generated pure, and subsequently unites with a base which it meets with, either in the nascent state, or in its progress through the structure of the kidney. The phosphate of ammonia having been introduced into the system, meets with the uric acid, or urate of soda, and becomes decomposed; the phosphoric acid combines with the soda of the urate, forming a most soluble salt. It is

thus seen that a most insoluble salt is exchanged for one as oppositely soluble. This, however, is not all the aid we get from it, for this new product, the phosphate of soda, according to the valuable researches of Baron Liebig, has a remarkable effect upon uric acid, inasmuch as he has shown that it has the power of rendering it soluble with facility in water. The before combined uric acid being set free, part unites with the ammonia of the phosphate, and the remainder is rendered very soluble at the high temperature of the body, through the agency of the formed phosphate of soda. Liebig states, "at a higher temperature, the phosphate of soda dissolves a larger amount of uric and hippuric acids than at a lower." The ammonia of this medicine is thus seen to serve a most important purpose in uniting with part of the uric acid, and forming a compound far more soluble than the acid itself, as it is a fact well established by Dr. Prout, that uric acid requires 10,000 parts of water, at 60° for its solution, whereas the urate of ammonia dissolves in 480 times its weight of the same fluid, or, in other words, is more than twenty times as soluble. By these means, the free and combined uric acid existing in the system in these diseases will be dissolved and rendered capable of easy elimination by the kidneys, and the pains, and other distressing symptoms occasioned, as Dr. Prout states, by the derangement going on in those "secondary assimilating processes," by which the nervous substance and immediate appendages, as also the fibrinous portion of the muscles are produced and maintained, will be shortly subdued, and by strict attention to the causes which give rise to that abundance of uric acid in the system, the disease will be altogether checked. If dyspepsia is prominent, and the digestive organs cannot assimilate the usual quantity of nitrogenized food which is introduced into them, it should be lowered, as likewise in those cases where too great a quantity is taken and assimilated, compared to that which the waste of the system requires. Again also, a frequent cause of this deposit exists in the arrest or diminution in the cutaneous excretion, whereby the kidneys act as compensating agents, and the system at large becomes impregnated with this nitrogenized excretion.

As I have previously stated, I have now used this remedy, and with great success, in almost every variety of gout and rheumatism. In acute articular rheumatism I have not exhibited it during its more inflammatory stage; but after this has been subdued somewhat by the usual antiphlogistic treatment, it very speedily relieves the pains, and in the majority of cases prevents fresh joints from being attacked. I cannot speak positively from sufficient data at present, but I am inclined to believe that the chronic form which is not unfrequently left behind from the acute, may often be obviated. I feel convinced I have prevented, by administering this salt prior to the coming on of the

* "Commentarii de Morborum Historia et Curatione."

† Dr. G. Bird, "On Urinary Deposits."

‡ Mackintosh, "Practice of Medicine."

inflammatory symptoms, several times, attacks of gout and rheumatism, and this in individuals disposed to their invasion. In *chronic articular rheumatism*, I have used it after the bowels have been well cleansed by calomel or other purgatives, or if the constitution is vigorous, the vascular action strong, and heat high, after venesection, and I have got rid of these attacks much sooner than formerly. In muscular rheumatism, whether of the acute or chronic form, I have employed this remedy with greater success than in any other. After the action of the intestinal canal was somewhat regulated, I have generally been able, without further preface, to administer it in lumbago, pleurodynia, ischio-gluteal rheumatism, epicranial, (cephalodynia,) cervical, (auchenodynia,) and facial rheumatism. In these I have seen it of peculiar service, and in one case of rheumatic ophthalmia, after the inflammatory symptoms had been reduced, and the patient was annoyed with the pains about the eye and brow, in which I administered it, it was attended with alleviation and subsidence of the pains within sixteen hours of being commenced. I am not prepared to assert that this salt will prove of benefit in those cases of chronic rheumatism, where the disease has already affected the cellular tissue, bone, or cartilage, and occasioned such appearances of morbid anatomy as have been described by Hasse. It may relieve, but I cannot believe it possibly curative.

With respect to gout, my opportunities of applying this remedy have been less numerous than in rheumatism, yet numerous enough to enable me to speak with certainty of its great value as a remedy; when given in the doses I have mentioned, it produces but little sensible operation beyond that most important of all, the gradual (in two or three cases I have seen it act almost instantaneously,) diminution of the distressing symptoms. With this view I have always prefaced its use by well cleansing out the bowels with proper aperients, and then ordering the phosphate every eight hours in simple water, or occasionally in conjunction with a bitter infusion and spirits of nitre, the best infusion perhaps being that of the serpentaria, as it determines to the skin. Attention both before and during the administration of the phosphate to the due performance of the various functions connected with the primary assimilating processes is of great moment. A slight alterative aperient of mercurial pill and compound rhubarb pill, given every other night, twice or thrice, has answered well. I have seldom meddled with the inflamed part beyond ordering perfect rest, and exciting perspiration by means of fleecy hosiery or flannel, covered over with oil-silk, occasionally a light anodyne poultice or narcotic fomentation, and of course a consistent diet, and abstinence from every thing irritating both of body and mind, were points duly remembered. In the third case in which I employed the salt, it was strikingly beneficial. A poor man, a

dispensary patient, a very gouty subject, had had an attack for two or three weeks, being confined wholly to his bed or arm-chair. He had tried, and I had previously used, most of the most renowned remedies, with little or no relief. On a Wednesday afternoon he commenced taking the phosphate of ammonia, (ten grains every eight hours,) and on the Friday morning following he attended me at the dispensary, walking each way, and informed me he had lost all pain, and that the swelling and stiffness were rapidly subsiding. To use his own words, "the second dose of this last mixture had acted like a charm." On the Tuesday following he began his work again as a mason. I ordered his continuance for a short time of the salt, combining it with a bitter infusion, and the regular use of a mild aperient.

This latter point of continuing the remedy a short time, I consider a matter of importance, paying at the same time particular attention to the condition of the digestive organs. With regard to the value of this salt as a solvent upon the gouty concretions when formed, my experience does not enable me to speak with any certainty, but my observations lead me to state in a positive manner its powers to arrest the increase, and I believe the formation of them. So great is the solvent action of the phosphate of ammonia, after being introduced into the system, upon uric acid, that I am almost inclined to think calculous disease of that nature may be very greatly benefitted by its employment. It is worthy of consideration when we remember the frequent occurrence of uric acid calculi, and the fact that most others of different character have uric acid for their nucleus. In lithic acid gravel I have frequently used it, and experience has taught me that it causes a very rapid decrease and disappearance of the red crystal-line sediment; it quickly reaches the urine, (as I have testified oftentimes upon my own person,) when largely diluted. Mr. Alexander Ure* has recommended the benzoic acid for the same purpose. I have used it many times, but never with so marked a result as with the phosphate of ammonia. Dr. Garrod has stated, and his statement has been confirmed by Dr. Booth and Mr. Boyer, of Philadelphia, that uric acid is unaffected by the conversion of benzoic acid into hippuric acid, the urea alone being diminished.

It was my intention to have recorded at the termination of these remarks, the clinical experiments I have made with this salt upon gout and rheumatism, together with the cases which have been the foundation of this paper, with a chemical and microscopical detail of all particulars; but I fear I have already detained the Association too long, and must therefore reserve these particulars until a future occasion, merely remarking in conclusion, that the employment

* Med. Chir. Trans., Vol. xxiv.

of this or any other solvent which may be suggested, although it may relieve, is not the curative agent. For this we must go deeper into the causes, and attend to the pathological condition of those organs principally concerned in the primary assimilating processes upon which the excess of uric acid and its compounds I believe chiefly depends. I would not on this account depreciate the value of such a medicine as the phosphate of ammonia; on the contrary, as you have seen, I hold it of the highest value in lessening irritation and the urinary formations, at the same time that we are endeavouring to remove the primary cause of the deposit. Both of course are points of the highest importance in our treatment, and should be remembered as such.

20, Walcot Parade, Bath,
September, 1847.

CASE OF GENERAL ANASARCA;

TREATED BY DIGITALIS, GRADUALLY INCREASING
THE DOSE TO THE FULLEST EXTENT.

By DONALD M'DONALD, Esq., M.R.C.S., Tiverton.

On August 14th, 1847, I was consulted by Mr. T. P., aged 56, for general anasarca. He has been for many years occupied in agricultural pursuits, but his circumstances of life never required his exposure to vicissitudes of temperature. He states that he has been inclined to corpulency for some years. His habits have been rather those of a *bon vivant*, although he never greatly indulged in the use of alcoholic drinks. He has become moderate in his living since the commencement of his illness, (about two years,) in fact he has been quite obedient to the instructions set down by his medical advisers.

I found him in the following state:—Tumultuous action of the heart; frequent pulse; sense of weight and oppression in the region of the heart and epigastrium; dyspnoea at times very severe, amounting to orthopnoea; extreme difficulty (indeed an almost impossibility,) in mounting a hill; flatulence; frequent syncope; countenance with a distressed expression; anasarca general. The infiltration through the lower extremities was so great, that had not the remedies taken immediate effect, I should have had recourse to puncture on the morning of the 3rd day; bowels regular; urine very scanty, depositing a red sediment. The cause of the anasarca, (agreeably to the symptoms above given,) was disease of the heart and valves. Upon applying the stethoscope the following signs were revealed:—Murmur distinct to the right of the mesial line; distinct purring tremor. A *bruit de soufflet* attended the least exertion. In addition to these signs there was general venous congestion of the surface, more particularly the face, lips, neck, and hands. The jugular veins were much dilated and pulsating synchronously with the heart. My diagnosis was this:—Induration of the tricuspid and mitral valves, the latter to a less degree, and hypertrophy of the left ventricle. This state of things will therefore satisfactorily account for the supervention of anasarca.

I will just mention that he had given himself up to die some days before consulting me, from having experienced no relief from several members of the profession, under whom he had consecutively placed himself, and from the firm conviction that he was rapidly sinking and far beyond all aid.

August 14th. As I mentioned above, this was my first day's attendance. I ordered him:—

R. Pil. Hydrarg., Pulv. Scillæ, utr. gr. iv. M. Fiat, pil. ij., hora somni sumendæ.

The liver being somewhat at fault, the above was prescribed to ensure a supply of proper bile.

R. Tinct. Digitalis, m. xv.; Potassæ Acetatis, dr. j.; Sp. Juniperi Co., dr. ij.; Decoct. Scoparii Co., dr. xiv. Fiat haustus bis quotidie sumendus. Animal broths twice a day. A little gin and water at night.

15th. Rept. pilulæ. Rept. haustus cum Tinct. Digitalis, m. xxv., bis quotidie. Diet, &c., as yesterday.

16th. The patient this day stated that he felt better already. He said, to use his own expression, that he was not "so stiff."

Omittantur pilulæ. Rept. haustus bis die, cum Tinct. Digitalis, m. xxv.

17th. The swelling manifestly reduced; can fasten his boot-strings a little, which he has not been able to do for many months. Urine increased from a pint to a pint and a half during the night.

Rept. haustus, (bis in die,) cum Tinct. Digitalis, m. xxx. Diet, &c., as before.

18th. Swelling still reducing; urine increased to a quart last night; says he feels quite a new man; breathing much relieved, and he is altogether easier and more comfortable.

Rept. haustus, (bis die,) cum Tinct. Digitalis, m. xxxv.

19th. Urine and swelling in *statu quo*. I increased the Tinct. Digitalis, m. x., this day, making m. xlv. in each draught. Diet &c., as before.

20th. Three pints of urine passed during the night; swelling much abated; he states that he can move about much better, and ascend the stairs with very little trouble.

Rept. haustus, (bis die,) cum Tinct. Digitalis, m. l.

21st. Fully under the influence of the digitalis. Complaints of headache, dimness of sight with muscæ volitantes, and feeling of syncope. Has passed during the night at least two quarts of urine; swelling nearly gone, scarcely any *pitting*; he is now able to fasten his shoes tightly. His clothes hang about him in bags to such an extent, that he is obliged for common comfort, to have them *much* drawn in. From his feeling so weak this day, I ordered him—

R. Sp. Ammon. Arom., Tinct. Cinchonæ Co., utr., dr. j.; Mist. Camphoræ, dr. x. M. Fiat haustus quintis horis sumendus. Two glasses of wine and boiled mutton.

22nd. Effects of the digitalis still remaining. Rept. haust. ut heri quintis horis sumendus. Diet &c., as yesterday.

23rd. Effects of the digitalis rapidly passing off; serous infiltration has totally gone, and as regards his general appearance, he states that he is just the same as he used to be when in perfect health. He can