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*** START OF THE PROJECT GUTENBERG EBOOK EXPERIMENTS AND OBSERVATIONS ON
THE FOLLOWING SUBJECTS ***

EXPERIMENTS
AND
OBSERVATIONS
ON THE
FOLLOWING SUBJECTS;

1. On the preparation, calcination, and medicinal uses of
MAGNESIA ALBA.
2. On the Solvent Qualities of CALCINED MAGNESIA.
3. On the variety in the Solvent Powers of QUICK-LIME, when
used in different quantities.
4. On Various ABSORBENTS, as promoting or retarding
putrefaction.
5. On the comparative Antiseptic Powers of VEGETABLE
INFUSIONS prepared with LIME, &c.
6. On the Sweetening Properties of FIXED AIR.

BY
THOMAS HENRY, APOTHECARY.

Utut tamen se res habeat, ego bona saltem fide tradam quæ hactenus rescivi omnia.

SYDENHAM.

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MDCCLXXIII.

TO

THOMAS PERCIVAL, M.D. F.R.S. & S.A.

DEAR SIR,

WHEN I reflect how much the friendship with which you have favoured me has contributed to my happiness; that from you has been imbibed a considerable share of the small taste I possess for experimental inquiries; and that to your skilful and affectionate treatment I am greatly indebted even for the health I enjoy; it is impossible to hesitate a moment in the choice of a patron: gratitude and esteem direct me to inscribe this Treatise to you, and I cheerfully obey their dictates. If to these any additional motive had been wanting, I should have received it from your having been an evidence to the result of many of the experiments related in the following pages.

That your own health may long enable you to continue exemplarily useful to your friends and to the public, is the sincere and ardent wish of,

DEAR SIR,

Your truly affectionate
and very humble Servant,

THOMAS HENRY.

MANCHESTER,
18th Jan. 1773.

THE PREFACE.

A RIGHT composition of the several articles used in medicine, is of so much importance to the practice of it, that every attempt to improve or ascertain the method of preparing them, cannot fail of a candid reception from the public.

Though great advancement has been made within these few years in chemical pharmacy, by the labours of the very ingenious Dr. Lewis, and some other writers on chemistry and the materia medica, there is still a wide field left for improvement. It is to be wished that Apothecaries, to whose province researches of this kind more peculiarly belong, and many of whom are well qualified by a liberal education to pursue them with advantage, would give their attention to these material interests of the art: for while the several professors of medicine and of surgery, are most laudably and assiduously employed in adding to the enlargement of these sciences, why should the sons of pharmacy remain supinely inactive, and leave every thing towards the improvement of their profession to be performed by the members of the elder branch of physic, instead of contributing *their* share to its support? as if tacitly acknowledging themselves unequal to the task, and thereby incurring the too general, though unmerited, imputation of want of knowledge and skill in their department.

The first part of the ensuing Treatise, which relates *an improved method of preparing Magnesia Alba*, has been communicated to the College of Physicians; and that learned body have done the author the honour to insert it in the second volume of their TRANSACTIONS. It is here reprinted as a proper introduction to the subsequent pages.

The calcination of Magnesia is not a new process^[a]; but, as in this state it is a medicine not much introduced into practice, perhaps a few hints may be suggested, in regard to its medicinal and pharmaceutical properties, which are not generally known; and it is hoped that some useful information may be communicated relative to the various action of absorbent medicines on the bile.

In the succeeding chapters, it is attempted to determine how far, and in what proportion, lime promotes the solution of vegetable astringents, and other drugs in water; and whether the action of antiseptic medicines, thus dissolved, be in any degree impaired or increased by this mode of obtaining tinctures from them.

In endeavouring to contribute to the determination of the question, whether fixed air has the power of restoring sweetness to putrid substances, the Author may at first sight appear to have transgressed his proper limits; but, as fixed air, if possessed of this property, is likely to be a valuable acquisition to the materia medica, he flatters himself he shall incur no censure by the attempt.

THE CONTENTS.

	Page
CHAP. I.	
<i>An Account of an improved Method of preparing Magnesia Alba.</i>	1
CHAP. II.	
<i>Miscellaneous Observations.</i>	12
CHAP. III.	
<i>On the Medicinal Properties of Magnesia Alba.</i>	25
CHAP. IV.	
<i>On the Calcination of Magnesia Alba.</i>	39
CHAP. V.	
<i>On the Medicinal Virtues of Calcined Magnesia.</i>	48
CHAP. VI.	
<i>On the Action of various Absorbents, as promoting or retarding putrefaction.</i>	58
CHAP. VII.	
<i>On the Solvent Qualities of Calcined Magnesia.</i>	80
CHAP. VIII.	
<i>On the various Solvent Powers of Quick Lime in different Quantities.</i>	88
CHAP. IX.	
<i>On the comparative Antiseptic Powers of Vegetable Infusions prepared with Lime, &c.</i>	105
CHAP. X.	
<i>On the Sweetening Properties of Fixed Air.</i>	114
CHAP. XI.	
<i>A Review of the general Conclusions deducible from the foregoing Observations and Experiments.</i>	135
AN APPENDIX	143

ERRATA.

Page 8, line 14, after *quantity* read *of water*.

Page 10, line 18, for *interrupt* read *intercept*.

Page 13, line 1, read *is there said*.

Page 16, line 1, read *the other absorbents*.

Page 29, note, line 4 from the bottom, for *albuminis* read *aluminis*.

Page 31, line 4, for *patients* read *parents*.

Page 83, line 9, after *elegant* read *green*.

Page 126, line 3, erase the *comma* after *smell*.

Page 127, line 3, place a *comma* instead of the *semicolon*.

CHAP. I.

AN ACCOUNT OF AN IMPROVED METHOD OF PREPARING MAGNESIA ALBA.

ALTHOUGH MAGNESIA ALBA is a medicine which has been in general use for many years, yet the proper mode of making it is very little known. Our *pharmacopœia* affords us no information about it; and the *formula* which is given by the Edinburgh College, as well as that with which the ingenious Doctor Black^[b] has favoured us, is deficient in several circumstances. Hence the preparation of pure Magnesia has been confined to very few persons, who have preferred the emolument they have received by keeping their method secret, to the more diffusive utility of which a publication of it would have been productive.^[c] I therefore beg leave to lay before the public a process for the preparation of Magnesia, by which it will be in the power of every Apothecary to make it himself, in all respects equal to that which is sold by those who conceal their method.

I am the more strongly induced to make this communication, because the Magnesia which is generally to be found in the shops, is either extremely coarse and ill prepared, or, which is still worse, sophisticated with calcareous substances, differing greatly from true Magnesia. I have been assured by some Physicians, that they have met with it mixed with chalk, and even with lime, and I have sometimes seen it so adulterated: a fraud of very dangerous tendency, as this powder is so frequently administered to very young infants, and to adults of tender bowels and costive habits.

This medicine was originally prepared abroad, from the liquor called the *mother of nitre*, which is composed of a light earth united with an acid; and these being separated, either by a strong fire, or by the addition of an alkali, the powder was washed in water, and obtained the name of Magnesia Alba. Hoffman afterwards prepared it from the bitter remaining after the crystallization of sea salt, which he found to be similar to the mother of nitre. And the factitious Epsom salt being prepared from this bitter, and evidently composed of Magnesia and the vitriolic acid, Dr. Black, who has favoured the world with a number of very valuable experiments on this subject, made use of this salt with success for the same purpose.

Happening some years ago to live in the neighbourhood of a gentleman who has long been celebrated as the preparer of the most genuine Magnesia, and never having been able myself to make Magnesia comparable to his, by the commonly known methods, I was desirous of gaining some intelligence as to his process, and was at last so fortunate as to obtain some useful hints.

I availed myself of these, and after repeated trials, produced Magnesia equally pure, white, tasteless, light and impalpable with that of Mr. Glass; nay sometimes that of my own preparing has been superiour to his, and in one respect has generally the advantage of it, namely, that mine is not so stiff when dried, and may be reduced to the finest powder by simple pressure; whereas *his* requires some degree of trituration to break the lumps effectually; which I imagine may be owing to his pursuing Dr. Black's method of drying it, by straining and *pressing* out the water through a cloth.

The following is the manner of preparing it, which I have found successful.

Dissolve any quantity of *sal catharticus amarus*, commonly called Epsom salts, in its own weight of water; filter the liquor, and add to it by degrees a filtrated solution of pearl ashes in an equal quantity of water, stirring them gently until the mixed liquors have acquired the appearance of a complete coagulum: then cease adding any more of the alkaline lixivium; and, having diluted the precipitate, and mixed it intimately with a small quantity of hot water, immediately throw the mixture into a large vessel of boiling water. Keep it boiling for a quarter of an hour, then take it out, and put it into glazed earthen vessels. As soon as the powder has subsided, and before the water be quite cold, pour it off, and add a fresh quantity of boiling water: repeat these ablutions with several parcels of hot water, till the liquor has entirely lost its saline taste. Then let it be so agitated as to suspend the finer parts of the powder; in which state decant it into other vessels, and having separated the water from the Magnesia by inclination, put it on large chalk stones, till a considerable part of the humidity be absorbed. Then wrap it up in sheets of white paper, and dry it before the fire. Pour hot water on the remaining powder, stir it, decant it in its turbid state, and separate the Magnesia from the water as before. By these means, the whole, or most of it, will be reduced to an equal degree of fineness.

The separation of the Magnesia will be promoted by heating the saline lixivia before they are mixed; and the larger the quantity of water into which the precipitated powder is cast, the more speedily and perfectly will the vitriolated tartar, which is formed by the alkali of the *sal catharticus*, be washed off. Dr. Black directs that three or four times the quantity of water, to that of the solutions, should be added; but this I have found greatly insufficient. The neutral salt should be washed off as quickly as possible; otherwise, as he justly observes, by allowing the mixture to stand for some time, the powder concretes into minute grains, which when viewed with a microscope, appear to be assemblages of needles diverging from a point. These concretions cannot be redissolved by any washing, however long continued. His intention, in boiling the mixture, is much better answered, by adding it to the water when in a state of ebullition; and once boiling in this manner is more effectual than a dozen washings in hot water.

Much depends on the purity of the water used in the process. If it be hard pump water, the selenites with which it is impregnated will be decomposed, and the calcareous earth be

deposited, after boiling; which mixing with the Magnesia will render it impure, gritty and discoloured. Rain water collected free from impurities, or clear river water, are most eligible; but if the situation of the operator does not permit him to procure these in a proper state, he should either use distilled water, which has been kept till the empyreuma is gone off, or at least such pump water as is free from any calcareous or saline impregnation. When poured on the Magnesia, it should be strained through a thick linen cloth, so as to intercept any accidental impurities which it may acquire in heating.

The drying should be performed with expedition. To this end, the chalk stones should be exposed to a moderate degree of heat; and when they have been employed two or three times, should be dried before a fresh quantity of the Magnesia is put on them. Cleanliness should be particularly attended to through the whole process; and the vessels ought to be carefully covered, that no dust may enter.

We may safely make use of a large copper brewing-pan, to boil the Magnesia in; for as the acid is perfectly neutralized, there can be no danger of its quitting the alkali, to which it has a greater affinity than to the metal; and copper does not readily dissolve, even in acids, when boiling hot; nor have I ever observed the least corrosion, though I have frequently used such vessels for this purpose.

CHAP. II.

MISCELLANEOUS OBSERVATIONS.

SINCE the drawing up of the paper which has been the subject of the last chapter, some observations have occurred, which are either so immediately connected with, or at least deduced from it, that it may not perhaps seem inexpedient to introduce them in this place.

I was very much surprised to observe, in the Lectures lately published, *as delivered* by the very learned and ingenious Dr. Cullen, that Magnesia is there said to be no more purgative than any other absorbent earth. The sentence is this; (speaking of other absorbents) "Magnesia alba should have been added to this set. It has had a considerable reputation as an absorbent, and when neutralized, as a purgative; but I find it is not more absorbent than any of the rest, nor more purgative in less quantity, as chalk or crab's eyes given in the same quantity, viz. dramij, will have the same effect. Therefore it may be neglected."

Surely this must have been an error of the person who wrote down the lectures, and have escaped the notice of the ingenious editors; who, from their skill in chemistry, must know that pure Magnesia differs from every calcareous or testaceous earth with which we are hitherto acquainted. These earths are nearly insoluble in the vitriolic acid, and what part does unite with it, forms a selenitical salt, the most difficult of solution of all others, and of an astringent nature: whereas the Magnesia^[d] united with the same acid, produces what is commonly called Epsom salt, easy of solution, and purgative to the bowels. The former, with the nitrous acid constitutes a calcareous nitre, incapable of crystallization; with the marine acid a calcareous muriatic salt; and when dissolved in vinegar, the mixture spontaneously dries up into a friable sub-astringent salt: whereas Magnesia, with all these acids, forms *purging salts*; that with the nitrous acid, yellow, capable of being reduced into crystals retaining their form in a dry air, but melting in a moist one: with the muriatic acid, a salt is produced which does not crystallize, and easily melts when exposed to the air: with distilled vinegar, a saline uncrystallizable mass is formed, resembling glue both in colour and consistence while warm, but becoming brittle when cold. Dr. Black says, that two drachms of this salt purged a middle aged man four times; and half an ounce of the same gave a woman of a strong constitution no less than ten stools.^[e]

Besides, where an acid prevails, much smaller doses than two drachms of Magnesia prove purgative; and it seldom happens that even that dose of the other absorbents^[f] will produce the same effect. Nor am I singular in my opinion, when I declare my doubt whether Magnesia be not of itself in some degree purgative, independent of its junction with any acid whatsoever. It appears to be an earth *sui generis*. That of alum resembles it in some respects, yet differs from it essentially, when combined with the vitriolic acid: the alum is strongly astringent and antiseptic, the Epsom salt purgative and septic.

I have very lately seen a paper signed by Doctor Cadogan and dated in the year 1767, in which he complains grievously of the advertisers of Magnesia, making use of his name without his consent, and has published the process for making *his* Magnesia. The doctor's intent in this was doubtless benevolent, but his manner of preparing this powder is unnecessarily expensive and wasteful. He directs only one pound of lixivium tartari to five pounds of sal catharticus amarus, which is greatly insufficient to precipitate all the Magnesia. And he insists strongly on the superiority of the lixivium prepared from salt of tartar, to that made of potashes, as if the chemical effects of one, were different from the other. But, says the Doctor, potashes render the Magnesia bitter. Surely the vitriolated tartar produced by a union of one vegetable fixed alkali with the vitriolic acid, is equally soluble in water with that prepared with any other, and if so, will be as easily washed off from the Magnesia.

But behold a champion steps forth, and at one blow levels to the ground the whole tribe of Magnesia makers, who have procured it from the factitious Epsom salts. I confess I have not had the happiness to peruse this ingenious gentleman's pamphlet on the subject, but I have formed a very extraordinary opinion of his *candour, modesty, and knowledge*, from the very curious paper which he distributes with his Magnesia. Notwithstanding Doctor Black, and since him Mr. Glass and several others, have procured *pure* Magnesia from the factitious Epsom salts, Mr. Dale Ingram, assures us, that he has made an improvement, "which is by the learned esteemed one of the greatest acquisitions to the materia medica." And wherein does this mighty discovery consist? even that Magnesia prepared from the waters of Epsom, is superiour to that prepared from the bitter purgative salt; and he assures us that the Magnesia sold by him is so prepared.

To the first assertion I shall only reply, that every person at all conversant in chemistry knows that Magnesia earth is the same, from whatever substance it can be separated in a pure state; that the factitious Epsom salt yields it in as great a degree of purity as the salt of the Epsom water, and that Dr. Alston assures us, the artificial salt "by various and repeated experiments, made in France as well as in Britain, is demonstrated to be every way as good as, yea to be the very same with, the genuine made of the Epsom waters."^[g]

As to the other declaration, it will be sufficient to observe that one gallon of Epsom water contains only seven drachms of salt in a dry season, and hardly six drachms in a wet one;^[h] and that for this salt to precipitate its Magnesia properly, it is necessary it should be diluted with little more than its own weight of water.^[i] Six drachms of salt will yield two drachms of Magnesia. So that to procure a pound of this powder Mr. Ingram must evaporate above sixty

gallons of the water, to between five and six pints, before he begins the precipitation. Sure never did empiricism appear so thinly disguised!

In the preceding chapter, the necessity of using water free from any calcareous impregnation has been particularly insisted on, and I have, on another occasion,^[j] observed that great attention should be given to the purity of the water used in the making of all the saline preparations; and I may add in almost all the operations of pharmacy. Dr. Percival, in his ingenious experiments on water, found a quart of the Manchester pump water to contain upwards of sixty grains of adventitious matter.^[k] Suppose therefore, for instance, that in making the extract from a pound of peruvian bark, it be boiled only six times in the quantity of water directed by the London Dispensatory, nine gallons will be consumed in the process; which is a very moderate allowance, six coctions not being sufficient to extract all the virtues of that drug. Dr. Percival boiled half an ounce of bark twenty five times, in so many different pints of water, the last of which had some impregnation, and the residuum gave a deep colour, and considerable bitterness to rectified spirit of wine. If we likewise suppose only one half of the foreign contents of such water to be left by evaporation, then the quantity of calcareous and saline matter, undesignedly mixed with the extract, will be two ounces and two drachms, or nearly equal to the quantity of extract procured from a pound of bark by pure water. Thus this important medicine becomes grossly adulterated, without any such intention in the operator; and I know it is the common practice to use pump water in making it.

I have particularly selected the Peruvian bark, as requiring a very large quantity of water to extract the whole which it is capable of yielding; but the proportion of water which I have here allowed, will not be too great in obtaining extracts from most vegetable substances; and how greatly not only the quantity, but the quality of the medicine must be affected by the admixture of such a weight of insoluble calcareous earth, is so obvious, that it is needless to expatiate on it.

CHAP. III.

ON THE MEDICINAL PROPERTIES OF MAGNESIA ALBA.

THE medicinal uses to which Magnesia has hitherto been applied are in general so well known, that it will be necessary only to give a short summary of the cases in which it is beneficial, for the information of young practitioners, and of those of my readers who may not be acquainted with medical subjects, this medicine being frequently administered without the advice of a physician. If it should appear in the subsequent part of this treatise that Magnesia is possessed of any properties hitherto unsuspected in it, the sagacious reader will in a great measure be left to draw his own practical inferences therefrom.

MAGNESIA ALBA is a powerful absorbent, and is given with great success in disorders of the stomach and bowels arising from acidity. This preparation had been introduced into the materia medica abroad several years before it attracted the attention of our countrymen. The celebrated Hoffman having strongly recommended it to the medical world, some English practitioners began to prescribe it, and Dr. Cadogan bestowing high encomiums on it, in his treatise on the nursing and management of children, it soon made its way into general practice, and supplied the place of the testaceous powders and chalk, which before this period were the medicines usually given to correct acidities in the primæ viæ. The acquisition of this medicine was of the more importance, on account of its entire and easy solution in acids, and of the purgative quality which it possesses; whereas the common absorbents are apt to form concretions, and to induce costiveness; strong objections to their free exhibition, as these properties render them peculiarly unfit for the bowels of tender infants who are particularly liable to diseases of this class.

This tendency to acidity generally attends children during the first months and the time of dentition, and discovers itself when too redundant by the green stools, sour vomitings, gripes and purgings which it occasions: and as the nerves of children are extremely irritable, spasmodic affections are often the consequence of this acrid stimulus being retained in their bowels. In these cases Magnesia may be administered in doses from five to twenty or thirty grains, according to the age of the infant; and in proportion as it is intended to act, either as an alterative, or as an easy purgative.

It has been a common practice to give Magnesia to children as a preventive, and to mix it for this purpose with their food, in order to correct that disposition which milk and the farinaceous aliments have to turn sour. This however should be done with caution, for it is only the excess of acidity which is prejudicial to infants,^[l] some degree of it is necessary; and should we too officiously and entirely destroy, what we ought only to restrain within due bounds, we may create disorders of an opposite nature to those we have endeavoured to prevent, and instead of an acid, produce an alkalescent disposition in the first passages. Indeed I fear that diseases have been more frequently created than obviated by the use of preventive medicines, and they should only be allowed in cases where the approach to disease is manifest. But when a child is in a healthy state, the best means to preserve him from a superabundant acidity, is to pay due attention to the regulation of his diet, to give him proper exercise, not to confine him too much in the foul air of hot unventilated rooms, to wash his whole body every day in cold water, and to rub him very well night and morning with a dry flannel, taking care that his stomach be not too full at the time when this friction is performed.

Nor would I advise parents to rely with too much security on the virtues of this medicine, where the disorders of their children are complicated, or obstinate. The advice of the sagacious and distinguishing practitioner will then be necessary to direct what method of treatment is to be pursued. Nor can I here avoid lamenting that the management of children when diseased, is so often in the hands of nurses and ignorant women, from an absurd notion that their diseases are not proper subjects of medical investigation; when in truth, there are none which require a clearer judgement, a quicker penetration, or a greater share of medical knowledge in the prescriber.

During the period between dentition and puberty, the diseases attendant on a lax fibre still continue, though not so predominantly as in the former stage; yet aescency is the manifest cause, or at least the concomitant of many of the complaints to which children are at this time liable. To this they are disposed, notwithstanding the change in their diet to a more alkalescent kind, by the great quantities of fruit, frequently crude and unripe, cakes, and other sweet and greasy food with which they are too often indulged. By these errors their bowels are overcharged, their digestion impaired, and the aliment remaining too long in the stomach becomes sour, and occasions vomitings, head aches, and other complaints which are often thought to proceed from worms, and indeed are frequently attended with that disorder; as the crudities thus generated in the bowels serve as a nidus for these destructive vermin. Here likewise Magnesia may be of considerable advantage as an alkaline purgative, neutralizing the offending acid, and at the same time promoting its discharge by stool. But if the stomach be overloaded with mucus or undigested aliment, a gentle vomit ought to precede the exhibition of the Magnesia.

And even in a more advanced stage of life, persons of weak habits, and who lead sedentary lives, are often afflicted with indigestion, sour eructations, heart-burn, vomitings, and costiveness. These disorders very frequently attend women during their state of pregnancy, and are sometimes almost instantly removed by the use of Magnesia. Dr. Watson^[m] has published the

case of a pregnant woman, who was afflicted with such severe vomitings as to bring on convulsions, hiccoughing, and violent pain at her stomach. What she brought up was acid, and so very acrimonious, as to inflame and excoriate her mouth and throat; and the great uneasiness she felt at her stomach upon swallowing any liquor that had the least degree of acrimony, or was more than lukewarm, made it probable that the internal surface of the stomach was affected in the same manner. In this desperate situation, after a variety of remedies had been tried in vain, the stomach was washed with unsalted mutton broth, till the liquor was discharged without any acid taste. Her pain was by this means abated, but in about two hours was apparently returning with the same violence as before. This ingenious Physician then directed a drachm of Magnesia to be given in mutton broth, and to be repeated as often as her pain returned, without any regard to the quantity the whole might amount to, supposing her pain to continue severe. The first dose relieved her, and in three days she took three ounces of Magnesia; and in the next three days, two ounces more, by which time all her symptoms were removed. It is remarkable in this case that a hypercatharsis was not the consequence of taking so large a quantity of Magnesia, where there was so much acid to neutralize it.

In bilious habits, where there is generally a disposition in the stomach contrary to acidity, Magnesia is usually esteemed to be improper, taken alone: but I am dubious whether this opinion is well founded, and many reasons for these doubts may be deduced from the experiments hereafter to be recited. However, where putrid bile is to be corrected and discharged, by stool, very good purposes may, perhaps, be answered by taking the Magnesia, joined with a sufficient quantity of acid to neutralize it, while in a state of effervescence; or by swallowing the Magnesia and the acid, one immediately after the other, so as to produce the fermentation in the stomach: for thus the fixed air with which the Magnesia so greatly abounds, being let loose, may powerfully correct the tendency to putridity in the contents of the primæ viæ, and at the same time evacuate them downwards.

How far Magnesia may be of service in diseases of the skin I do not take upon me to determine. Several authors have attributed cutaneous eruptions, and indeed the ancient chemists ascribed almost all disorders, to the presence of an acid in the blood; whilst others absolutely deny that an acid can be admitted into the lacteals, or, if admitted, exist in the blood in a state of acidity. In these cases however, if an acid acrimony abounds in the stomach and bowels, with a costive habit, and pale complexion, Magnesia will be a useful corrector, and entering into the circulation in the form of a mild neutral salt, may act as an excellent alterative,^[n] proving both diaphoretic and diuretic.

Having thus given a cursory detail of the medicinal properties of Magnesia, in its natural state, I shall now proceed to consider it in a state of calcination: but before any description of its uses in medicine be given, it may be proper to take a view of the changes which are produced in the nature of it by this operation.

CHAP. IV.

ON THE CALCINATION OF MAGNESIA ALBA.

THE free spirit of inquiry, and taste for experimental researches which have of late so happily prevailed, have given rise to several very important discoveries in the course of the last half century; among which, those of the properties of the electrical fluid, and of fixed air, hold a principal rank. That excellent philosopher and experimentalist, the late Doctor Hales, first proved that most bodies contain, as one of their component principles, a quantity of air, differing from that of the common atmosphere in several of its properties. The proportion of this element varies in different substances, and in some constitutes nearly one half of their weight. All calcareous earths, the testaceous powders, Magnesia and alkaline salts contain it abundantly, and have the strongest affinity with it of any bodies, except metals. From all these it is discharged by an acid, and the stronger the acid is, the more sudden and plentiful is the discharge of this vapour, which is of the same nature as that emitted by fermenting liquors. Though it may be inspired in small quantities with impunity, and, as appears from some late observations, even with advantage in some cases,^[o] yet it is a known fact that animals expire sooner in a receiver filled with fixed air, than in vacuo. Lastly, it is said to have the remarkable property of rendering putrid substances sweet.

In the precipitation of Magnesia, the acid of the Epsom salt uniting with the alkali which is added to the solution, expels the fixed air which the latter contains; but the vapour instead of being dissipated as in the common effervescing mixtures of acids and alkalis, is quietly and immediately absorbed by the Magnesia earth, to which it has a strong affinity; and thus a double elective attraction takes place.

The very large proportion of this element contained in Magnesia Alba has given Dr. Black an opportunity of throwing much light on this hitherto obscure subject; and that excellent chemist has drawn such inferences from the result of his experiments on Magnesia, Quick-lime, and other alkaline substances, as are of the utmost importance to chemistry. As this treatise may fall into the hands of several who may not have an opportunity of perusing the valuable Essays in which these experiments are contained, I shall take the liberty to make a short extract from them, in order to elucidate the subject of the subsequent pages.

The first object of Dr. Black's enquiry was, whether Magnesia could be reduced to Quick-lime. To this purpose, he calcined an ounce of Magnesia in a strong fire. When taken out of the crucible and weighed, it had lost seven twelfths of its weight. Combined with different acids, it formed salts of a similar nature to those constituted by the same acids with the uncalcined powder; but dissolved in them without the least degree of effervescence.

It slowly precipitated the corrosive sublimate of mercury, in the form of a black powder; whereas before calcination a dark red precipitate was formed from the same substance. Mixed with a warm solution of salt ammoniac, it separated the volatile alkali from the acid; but it made no separation of an acid from a calcareous earth, nor did it induce any change upon lime-water; whereas in an uncalcined state, it rendered quick-lime mild. Lastly, being digested for some hours with water, it produced not the least alteration in the water.^[p]

In pursuing his inquiries, he found that a very small portion of what had been lost in the calcination was water, and that the other part was fixed air, by the loss of which the Magnesia was deprived of its power of effervescing with acids. And from hence the Doctor concluded, that the change made in calcareous substances and in Magnesia by calcination, was chiefly produced by depriving them of this air; and that this volatile Proteus may be conveyed from one body containing it to another body with which it has a greater affinity.

Thus lime being deprived of its air by calcination, and having a stronger affinity with it than alkaline salts have, being mixed with a lixivium of these salts, absorbs all the air from them, deprives them of their property of effervescing with acids, and renders them more acrid, at the same time that the lime becomes mild, and incapable of impregnating water, but recovers its power of fermenting when mixed with an acid.

CHAP. V.

ON THE MEDICINAL VIRTUES OF CALCINED MAGNESIA.

REQUENT objections have been made to the use of Magnesia Alba, on account of the great quantity of air which enters into its composition. Whenever it meets with an acid in the stomach they immediately unite; but in forming this union, all the air contained in the Magnesia is discharged with a great degree of effervescence, and recovering its elasticity sometimes occasions very uneasy sensations in weak bowels,^[q] inflating and distending them overmuch, inducing griping pains, and above all a sense of debility or sinking, which is not easily described.

My much respected friend Doctor Percival, who had often complained of these disagreeable effects from the use of Magnesia, suggested to me the idea of depriving it of its fixed air by calcination, having been informed that they would be obviated by this method. Doctor Black had indeed proved the practicability of the process, but he does not appear to have made trial of the calcined Magnesia as a medicine. In consequence of the above hint I calcined some Magnesia, and was afterwards insensibly led to make further experiments, the event of which, I hope, will be deemed of sufficient importance to apologize for my communicating them to the public.

EXPERIMENT I.

Eight ounces of pure Magnesia Alba were calcined with a strong fire in an air furnace. Three hours calcination were necessary to discharge the whole of the air from the Magnesia. When removed from the fire, it had lost four ounces and three drachms of its original weight, and produced no effervescence with acids; it had not acquired any degree of acrimony to the taste, and when thirty grains of it were diluted with a few spoonfuls of water and swallowed, it occasioned no uneasy sensation in my stomach, nor sense of heat in my throat; proved nearly as aperient as a double quantity of uncalcined Magnesia, and operated without the least griping. It was remarkable that calcination had not reduced the powder in bulk, in proportion to the diminution of its weight.

By the process of this experiment, Magnesia Alba is not only divested of the disagreeable qualities which have been alluded to, but acquires new properties which render it likely to answer some very important practical purposes.

Doctor Macbride, who has with the greatest ingenuity and accuracy, prosecuted the investigation of the nature of fixed air, discovered, that a large quantity of it is discharged in the fermentation of alimentary mixtures; and that the saliva being, in a healthy state, void of air, acts as an absorbent of it, thereby moderating and restraining the discharge of this vapour in the stomach. But when the tone of that viscus is too relaxed to perform the digestion of the aliment with proper vigour, or the saliva is diseased and corrupted, the air expelled from the food becomes too elastic, and produces those disorders which are commonly termed flatulent; and, perhaps, by its effects on that prodigious plexus of nerves which is diffused over the coats of the stomach, may sometimes occasion spasmodic or paralytic affections.

It has been observed above, that calcareous earths, alkaline salts, and Magnesia, being deprived of their air, attract it from every substance with which it has a smaller degree of affinity. The two former becoming highly caustic by the loss of their air cannot be administered but in very small doses. But the calcined Magnesia being absolutely divested of air, though not rendered acrimonious, and being able to absorb a large quantity of this elastic flatus, may act more powerfully than the whole tribe of carminatives, yet essentially differs from them in many respects. *They* contain a large quantity of air; *Magnesia* in this state is entirely free from it; *Aromatics* may be apt to ferment, and increase acidities; the *calcined Magnesia* is incapable of effervescence, and powerfully corrects an acescent disposition in the gastric juices; the *former* constipate the belly; the *latter* is laxative.

From this property of Magnesia, when calcined, of absorbing air, it occurred to me, that it would of all others be the most proper cathartic for patients labouring under the stone, who might be taking the lixivium saponarium, having the advantage over all the vegetable purgatives, which abound with air, and consequently have a tendency to render the caustic alkali mild and inert. I even flattered myself that it might coincide in promoting the efficacy of that powerful solvent of the human calculus. Dr. Macbride's theory, that the lixivium acts by depriving the calculus of its fixed air, appears to be well founded; and Mr. Chittick in the exhibition of his nostrum, which, notwithstanding all his empirical arts to disguise it, is now known to have been the soap ley, kept his patients from every kind of diet abounding with air. We may therefore venture to recommend it, though not as a lithontriptic, being insoluble in water, yet as an assistant to the lixivium, by absorbing a part of that air in the primæ viæ which would otherwise be attracted by the caustic alkali, and thereby render it incapable of acting on the calculus.

In all the diseases attended with an acescent disposition in the first passages, in which Magnesia has been recommended in the third chapter, the calcined powder may be given with superiour advantages, as it will not produce any of those inconveniences, which have been attributed to that medicine when uncalcined. Besides that it will act in a three-fold capacity, viz. as an absorbent of air, and of acidity, and also as an easy purgative. I know several persons who could never bear to take the common Magnesia, with whom the calcined perfectly agrees. It seems likely to be very serviceable in flatulent cholics, and I have been informed of one very obstinate

chronical case of that kind, which was greatly relieved, though not perfectly cured by the use of it in the Chester Infirmary, under the direction of a very judicious and ingenious physician.

Even in gouty habits, joined with some warm aromatic, it may probably be found useful in correcting the very great flatulency which so much afflicts persons of this constitution; and perhaps the Cayenne pepper would be the most proper addition to it, on account of the small quantity of this spice that would be necessary to make the Magnesia gratefully warm to the stomach.

It will appear in the succeeding chapter that calcined Magnesia is strongly antiseptic: but I shall postpone my observations on that subject till I have related the experiments which prove its claim to that property.

CHAP. VI.

ON THE ACTION OF VARIOUS ABSORBENTS AS PROMOTING OR RETARDING PUTREFACTION.

The whimsical and ill-grounded hypotheses which were framed by the chymists of the sixteenth century, had, unhappily, too much influence, on the medical practice of that and the succeeding age. Among other false theories which the physicians had adopted from them, was that of attributing the origin of most diseases either to an acid or alkaline cause: but the former, being more obvious to the senses, was supposed to be the most frequent parent of diseases. Among others, fevers, even of the putrid kind, were imagined to be occasioned by an acid, and from hence the testaceous medicines acquired so high a degree of reputation, as to be deemed the grand correctors of acrimony, and were almost universally prescribed as alexipharmics; and the most celebrated compositions which are ranged under that head, contain a large proportion of these powders.

But a very learned physician, by a series of accurate and ingenious experiments on septics and antiseptics, has proved that chalk and all the testaceous powders accelerate the corruption of animal flesh, and from the result of one he made on bile with crab's eyes, he naturally concluded that all these substances would produce the same effect on that humour, as they had all uniformly proved septic to flesh. Yet, even upon this supposition, he candidly allows, that in some fevers, they may have their uses, even where no offending acid exists; as in order to cure some diseases, it may be requisite to attenuate the humours, and relax the fibres by a degree of putrefaction, and that possibly the crisis of fevers of this kind, may be hastened or perfected by the testaceous powders. In diseases, however, where the disposition to putrescency is already too strong, all medicines, which in the smallest degree increase such tendency should be studiously avoided; and, on this account, the administration of the testacea in putrid, malignant fevers has of late been condemned by some ingenious writers. I was myself fully convinced of the rectitude of this opinion, and, in drawing up an account of the medicinal uses of Magnesia, had therefore suggested the impropriety of prescribing them where a bilious acrimony prevails. But not being able to recollect, that the septic powers of Magnesia had ever been experimentally proved,^[r] I thought it would be most satisfactory to determine them by that method; little doubting but that the event would justify my doctrine. My inquiries evince the accuracy with which Sir John Pringle has made his experiments, but as I was induced to carry the investigation of this subject further than he has proceeded, very different practical inferences, from those I at first expected, may, perhaps, be deduced therefrom.

EXPERIMENT II.

Two drachms of fresh beef, two scruples of Magnesia, and two ounces of distilled water were mixed in one bottle; and in another the same quantity of beef with two ounces of distilled water only: the meat was cut small, and the bottles were placed uncorked in a heat rather inferior to that of the human blood. In twenty four hours the beef in the mixture with Magnesia was become quite putrid. The standard was perfectly sweet, and remained for some days, before it acquired the true putrid foetor.

Being thus convinced that Magnesia is possessed of the property of hastening the putrefaction of animal flesh, in common with the rest of the absorbent tribe, it was imagined, that it might be of some consequence to practice, to determine how far it exceeded or was inferior to the calcareous and testaceous earths as a septic; and also whether calcination produced any difference in it, in this respect. In reciting the experiments, where I only mention *Magnesia*, I always would be understood to mean that powder in its uncalcined state, the calcined shall constantly be distinguished by that epithet. It also appeared to be a convenient opportunity of repeating the inquiry, how far the addition of the testacea might take effect in diminishing the antiseptic qualities of the *contrayerva* root.

EXPERIMENT III.

Into one phial were put two scruples of Magnesia, into a second the same weight of calcined Magnesia, and into three others the same quantity of chalk, *pulv. e chel. cancr. comp.* and *pulv. contrayerv. comp.* To each of these, two drachms of fresh beef, and two ounces of distilled water were added. A sixth phial was kept as a standard, and contained only the same proportions of beef and water. The bottles, distinguished in the order they are mentioned by the numbers 1, 2, 3, 4, 5, and 6, were placed in the same heat as that to which the Magnesia was exposed in the former experiment, and were frequently shaken up and examined.

In twelve hours, number 1 began to smell; an intestine motion was perceptible in numbers 3, 4, 5, and 6, but especially in the chalk. In twenty-four hours, number 1 was become highly putrid, number 3 smelled offensively, number 4 had acquired a very slight foetor, as had number 5 which fermented briskly. The standard had acquired a vinous smell, but number 2 remained unchanged.

In thirty six hours, number 3 was very putrid, numbers 4 and 5 had made little progress since the last examination, though number 5 was rather more putrid than the other, allowance being made for the peculiar odour of the *contrayerva*; but in four hours more they both stunk intolerably. The standard continued two or three days longer before it became absolutely putrid, and the calcined Magnesia preserved the beef untainted for several days longer, when it was removed to make room for other phials. The water which was mixed with the calcined Magnesia differed from all the others in not becoming bloody, nor did the beef in it seem so tender as when infused in lime

water.

When I made the first experiment, I had not observed any discharge of air from the Magnesia and beef, and in the present one no fermentation was perceptible either in number 1 or 2. As this was an unexpected circumstance in the former, I repeated the experiment several times, but the event was always the same.

Magnesia was afterwards compared with crab's eyes, burnt hartshorn, and prepared coral. The mixture with Magnesia grew putrid first, afterwards that with the crab's eyes; the other two remained for some hours longer before the putrid fœtor came on.

From the above experiments it appears that Magnesia Alba, when replete with fixed air, is a stronger septic to animal flesh than any other absorbent which was compared with it; and yet when deprived of its air by calcination, it powerfully resists putrefaction. Dr. Macbride has endeavoured to account for this difference between calcareous earths and quick-lime, by supposing the particles of the lime to insinuate themselves intimately into the texture of the beef, and to prevent the escape of the fixed air, by attracting, absorbing, and thus confining it within the substance of the beef. How far this theory is satisfactory is not my province to determine; and the matter is so obscure, that I do not presume to offer any conjecture of my own, relative to the reason of it.

Nitre is found to be a strong antiseptic when applied to animal flesh, but to resist the putrefaction of bile with a very disproportionate force: and Dr. Percival has lately observed the same difference in the action of the Columbo root. These variations encouraged me to try the effect of Magnesia on gall; but being strongly prepossessed with the notion of its septic quality, I entertained very small hopes of a different event. I was also desirous to compare the action of the calcined Magnesia with the other. The heat used in the succeeding experiments was the same as that in the preceding trials.

EXPERIMENT IV.

To two drachms of fresh ox gall, were added two scruples of Magnesia, and two ounces of water, in one phial. Two scruples of calcined Magnesia with the same quantity of gall and water were placed in another; and a third containing two drachms of bile without any other addition than water, served as a standard, which began to have a rank smell in forty-eight hours, and in sixty hours was highly offensive. The calcined Magnesia and bile emitted a sweetish smell, something resembling that of the urine in a diabetes: the liquor which swam above was quite pellucid and colourless, whereas that of the other Magnesia was turbid and tinged green with the bile. Both were perfectly free from any putrid fœtor; the latter continued so for ten days, and the bile with the calcined Magnesia remained unchanged as long as any notice was taken of it.

EXPERIMENT V.

Twenty grains of Magnesia preserved six drachms of ox's gall free from any signs of corruption for twenty-four hours after the standard containing gall and water, of each six drachms, had become putrid. A scruple of the calcined Magnesia mixed with the same proportions of gall and water, remained without any alteration as long as they were attended to, which was about ten days.

EXPERIMENT VI.

The putrid liquor which had been used as a standard in the fourth experiment, was divided into four parts, one of which was continued as a standard, to another was added about half a drachm of Magnesia, and an effervescence was procured by some drops of oil of vitriol. The offensive smell continued for a few minutes, but was soon much abated, and at length entirely sweetened. To another portion was added twenty grains of Magnesia only, this in fifteen minutes had almost lost its putrid smell, and in two or three hours became quite sweet. To the fourth was added the same weight of calcined Magnesia, which almost instantly deprived the liquor of every degree of putridity. The standard was then mixed with a scruple of crab's eyes, which, for about a minute, seemed to diminish the fœtor, but it then returned as strongly as ever; whereas the others continued sweet for several days.

EXPERIMENT VII.

Two drachms of putrid bile, which had been kept closely corked in a phial since the year 1770, and smelled very offensively, were mixed in a cup with twenty grains of Magnesia, and half an ounce of water, and thereby restored to sweetness. Twenty grains of calcined Magnesia were also added to two drachms of the same bile: on stirring them a pungent smell was observed, like that of volatile salts, and half an ounce of water being put to the mixture, the bile was totally deprived of any putrid smell. Even five grains of the same powder sweetened two drachms of putrid gall.

EXPERIMENT VIII.

Magnesia, calcined Magnesia, chalk, crab's eyes, *pulv. e chel. cancr. c.* and *pulv. contrayerv. comp.* each in the proportion of two scruples to two drachms of ox gall and two ounces of water, were exposed to the usual warmth. The crab's eyes mixture grew rank in twenty-four hours, and in forty-eight was absolutely putrid: the bile with the chalk was in the same condition in twelve hours more. The Magnesia mixture became putrid on the ninth day; the *pulvis e chel.*^[s] on the tenth; but the *pulvis contrayerv. comp.* preserved the bile from corruption about three weeks,

and no change was perceptible in that with the calcined Magnesia when examined above a month after their first admixture.

EXPERIMENT IX.

Twenty grains of Magnesia, and the same quantity of chalk, were separately neutralized with distilled vinegar, and their effects on ox gall compared with that of thirty grains of the artificial Epsom salt dissolved in a sufficient quantity of water. The bile in this solution became putrid in about sixty hours. That in the solutions made in the vegetable acid retained its sweetness for several days longer.

These experiments, which terminated so very differently from what I had expected, seem to justify, in some degree, the practice of giving the testaceous and absorbent medicines in fevers of a putrescent type, at the same time that they point out some of that class which ought to be avoided, and evince how fallacious a method it is to judge of the effects of medicines *a priori*.

As the bile is, by many, supposed to be the great source of putrid diseases, ought not the antiseptics which may be prescribed in these cases, to be such as more particularly impede the corruption of this fluid, rather than that of flesh?

On account of the superiour antisepticity of the calcined Magnesia to most of the absorbents, and its greater purity and solubility, together with the probability of its acting as an evacuant, as well as a corrector of putrid bile, does it not appear to merit a preference to all other medicines of this class?

In diseases where an acid cacochymy prevails, and an alkaliescent diet, such as wild fowl, fish, &c. is prescribed, but from the scarcity of these articles in some countries, cannot be complied with; may not taking Magnesia or the testaceous powders, immediately before or after meal time, coincide with this intention, by increasing the putrefactive fermentation of other animal food in the stomach, which in these disorders is almost totally subdued by the superabundant acid?

But where animal food is used in putrescent diseases, either through necessity, or the obstinacy of the patient, ought not Magnesia, in an uncalcined state, and all the calcareous and testaceous earths to be carefully abstained from?

Dr. Percival, in a volume of very ingenious experiments and observations which have been before referred to, has mentioned a physician of his acquaintance, who always observed his stools to be more particularly offensive after having taken Magnesia. Might not this proceed from the action of the Magnesia on the animal food he had eaten; and is it not reasonable to suppose that the effect might have been very different where a vegetable or milk diet had been used, as is generally the case in putrid fevers, and in young children?

I know a person whose stools are, in common, very little tinged with bile, who after taking calcined Magnesia, evacuates fæces of a very bilious appearance, though less fœtid than usual. It is a fact worthy of observation, that in the experiments which were made with calcined Magnesia and bile, the latter was absorbed by, and had united with the former; and another remarkable circumstance was, that the watery part of all the mixtures which resisted putrefaction, acquired a very pungent, saline taste.

CHAP. VII.

ON THE SOLVENT QUALITIES OF CALCINED MAGNESIA.

R. Macbride, whose experimental researches have very justly acquired him a high degree of reputation in the philosophical world, supposes fixed air to be the combining principle of bodies, and has applied this ingenious theory to pharmaceutical improvements. He discovered that lime triturated with resinous gums, promotes their dissolution in water; which, he thinks, is thus enabled to take up the same parts of these substances, as are soluble in spirit of wine. These aqueous tinctures are transparent, not milky like the solutions made with yolk of egg, or gum arabic; but the lime communicates a highly disagreeable taste to them, and the action of lime water, which he used in some instances, is not sufficiently powerful to extract strong tinctures from these bodies. As calcined Magnesia has a great affinity with fixed air, I was desirous of trying whether it would contribute to render resinous substances soluble in water; for being itself insoluble, the solutions would consequently be free from any other impregnation than that of the resins.

EXPERIMENT X.

Five grains of camphor were rubbed for five minutes with an equal quantity of calcined Magnesia: after the camphor was reduced to powder, it united into a hard concrete with the Magnesia, but immediately dissolved on the addition of a small quantity of distilled water, of which an ounce was mixed with them, and immediately passed through filtering paper. The filtrated liquor was highly impregnated with the camphor.

EXPERIMENT XI.

Five grains of opium triturated in the same manner, yielded a transparent tincture, of as deep a colour as the tinctura Thebaica of the London Dispensatory, and tasting strongly of the opium.

EXPERIMENT XII.

Gum guaiacum and calcined Magnesia, of each a scruple, being rubbed with an ounce of water, and filtered, gave an elegant green tincture, quite transparent, and possessing, in a considerable degree, the taste of the gum.

Gum galbanum, storax, mastick, myrrh, assafætida, scammony and balsam of Tolu, being severally triturated with equal weights of calcined Magnesia, diluted with water and filtered, afforded neat tinctures, strongly impregnated with the different drugs.

EXPERIMENT XIII.

In order to determine the quantity of opium thus dissolved, half an ounce of crude opium, the same quantity of calcined Magnesia, and eight ounces of distilled water were rubbed for a quarter of an hour in a glass mortar, and having stood to infuse during two hours, the liquor was separated through paper. The tincture was of a darker colour than that before described, and was reduced by a gentle heat to a pilular consistence. This extract weighed sixty-eight grains, which, allowing for impurities, for what would be dissipated in evaporation, and for the air probably absorbed by the Magnesia, is a large proportion to be so soon dissolved. The residuum which was left in the filter was dried, and weighed six drachms.

EXPERIMENT XIV.

A drachm of Peruvian bark, twenty grains of calcined Magnesia, and four ounces of distilled water being rubbed together during fifteen minutes, the filtered infusion resembled in appearance the simple tincture of bark, and had an intensely bitter taste, but was not strongly impregnated with the peculiar aroma of the bark.

Thus then we have an easy and very elegant method of preparing aqueous tinctures from the gum resins, and administering them in a more convenient form and in larger doses than could be done when dissolved in a spirituous menstruum; and much more agreeably than in the half-dissolved state to which they are reduced by the aid of egg or gum arabic. The Magnesia does not impart any thing to them, whereas the lime will seldom be so saturated with air but that some part of it will remain soluble in the water: and as they may be given diluted to whatever degree the prescriber chuses, considerable advantages may be expected therefrom, it being probable that they will be better enabled to pervade the very small vessels; and the heating properties of the balsams be more effectually obviated than by any other mode of preparation.

Indeed, tinctures prepared by the above method, are not calculated for officinal compositions, but for extemporaneous prescription; as most of them, except camphor, deposite a sediment when they have been kept a week or two.

CHAP. VIII.

ON THE VARIOUS SOLVENT POWERS OF QUICK-LIME IN DIFFERENT QUANTITIES.

THE difficulty of solution in the vegetable astringents has been complained of by various writers on the *Materia Medica*. Water and alcohol are the menstrua in use; but great quantities of each are necessary to procure even a slight impregnation, and much heat and long boiling are said actually to destroy the astringent quality, and vegetable texture.^[f] As a menstruum capable of dissolving them with greater facility appeared to be a desideratum, not only in pharmacy, but in other arts, particularly in that of dying blacks, I resolved to try Dr. Macbride's method of increasing the solvent power of water, by means of quick-lime. But as I was aware that the quantity of lime he made use of in obtaining an aqueous tincture of Peruvian bark, would be too great for the dyer's use, I wished to use only such a quantity as would be sufficiently saturated with the air contained in the vegetable, to be itself precipitated; and to compare the tinctures thus made, with a standard prepared with simple water.

EXPERIMENT XV.

I rubbed three drachms of Aleppo galls reduced to powder, with four ounces of filtered rain water, for fifteen minutes, and then passed the solution through paper. It was very styptic to the taste, and was nearly of the same colour as Huxham's tincture of bark. The residuum in the filter was unchanged in colour. The bottle containing the liquor was marked number 1.

EXPERIMENT XVI.

Three drachms of the same galls, and two scruples of quick-lime, were triturated with four ounces of rain water, as in the last experiment. The filtered liquor had scarcely any astringency to the taste, and was of a very pale colour. The residuum was of a deep purple. Marked number 2.

EXPERIMENT XVII.

The same quantity of galls as in the two former experiments, after triture in the same degree with four ounces of lime-water, was separated by filtering through paper. The tincture thus obtained was highly astringent to the palate, of a deep chocolate colour, and the residuum was of a lighter brown than number 1. Marked number 3.

EXPERIMENT XVIII.

To each of the above tinctures were added forty drops of a strong solution of sal martis. Number 1 became very black. Number 2 changed colour but little, and on standing precipitated a brown sediment, which, the superiour part of the liquor being decanted off, became again transparent on the addition of a few drops of the vitriolic acid. Number 3 appeared to strike a deeper black than number 1; and these being tried as inks, number 3 seemed to have the superiority; but a slip of linen cloth being macerated in each for some hours, that in number 1 had taken a more perfect black than the slip number 3. No trial was made with cotton or woollen, which it is probable would have differed from the linen.

EXPERIMENT XIX.

Oak bark was used instead of galls, with similar success, except that the infusion made with lime-water was not so deep in colour as that with simple rain water, though much deeper than that prepared with quick-lime.

EXPERIMENT XX.

Peruvian bark, quick-lime, and lime water, in the same proportion as directed by Dr. Macbride, were rubbed together. The filtered infusion had little colour, tasted very slightly of the bark, though strongly of the lime, and on my blowing in a stream of air from my lungs, the surface of it was immediately covered with a cremor calcis, the liquor grew turbid, and deposited a copious sediment.

EXPERIMENT XXI.

The same quantity of Peruvian bark, and of lime water, without the addition of any fresh lime, being rubbed in the same manner, afforded a tincture tasting strongly of the bark, nearly of the same colour as the simple tincture obtained by proof spirit, and retaining its transparency when blown into. This tincture was much more strongly impregnated than one made by triture with common rain water only. And by this process, allowing a few hours for maceration, an infusion is prepared, greatly superiour in strength to any decoction, infusion, or tincture of bark I ever saw.

From the result of these experiments I suspect, that by using a greater quantity of lime in the sixteenth and twentieth experiments than the vegetable could saturate with fixed air, the water became so impregnated with lime as to be more unfit to act on the vegetable. From the purple colour of the residuum of number 2, it was evident that the galls were decomposed, but the water was not capable of dissolving and suspending the particles. Dr. Percival^[u] mentions his having unsuccessfully repeated Dr. Macbride's experiment with bark and quick-lime. To what then can this difference be owing? Perhaps it may be accounted for thus: It seems probable that the lime used by Dr. Macbride, not being fresh calcined, had recovered part of its air; for he says,

"It will no doubt be reckoned superfluous, that lime water is ordered to be added to these several substances, when they are also to be rubbed along with quick-lime; but the reason is this. *If the lime were so quick and fresh as to raise heat when common water is poured on it, the solution might then be made without the aid of lime water; but, as it will for the most part happen, that the lime kept in the shops will not be perfectly fresh, it will be best that the prescriber should direct lime water to be used.*" On the contrary, Dr. Percival used *lime fresh from the kiln*. These circumstances, if my theory be just, would greatly vary the event of the experiment; and the trials I have here recited seem to prove, that so great a quantity of lime, and even a much smaller than is directed by Dr. Macbride, if fresh, instead of increasing, diminishes the solvent power of water on astringent vegetables.

But as different drugs yield their virtues with more ease, and in greater quantity to some menstrua than to others, it seemed probable, that even a very small quantity of lime might render water less solvent of particular vegetables, than it is in its pure state, though with others as large or perhaps a greater quantity than what I had used might be necessary; and as the determination of this point might be of some use in pharmacy, the following experiments were made; in the relation of which I shall make use of numbers as before, viz. the vegetable rubbed with four ounces of distilled water will be distinguished by number 1, that with two scruples of lime and four ounces of lime water, number 2, and that with lime water only, number 3.

EXPERIMENT XXII.

Two drachms of snake root were rubbed for fifteen minutes with the above-mentioned different proportions of distilled water, quick-lime and lime water, and lime water alone.

Number 1 was a dark brown tincture, tasting strongly of the serpentaria.

Number 2, straw coloured, taste of the lime disagreeable, that of the root not distinguishable.

Number 3, amber coloured, tastes of the root.

EXPERIMENT XXIII.

Two drachms of Columbo being triturated in the same manner,

Number 1, dark brown tincture; tastes much of the Columbo.

Number 2, yellow; faint taste of the Columbo, but that of the lime very disagreeably prevalent.

Number 3, colour as number 1; but tastes more highly of the Columbo.

EXPERIMENT XXIV.

Two drachms of contrayerva root with the same treatment yielded in the following proportions:

Number 1 gave a pale brown tincture, tasting of the contrayerva.

Number 2, bright amber colour; taste of the lime so strong as to admit of no other.

Number 3 exceeded number 1 both in colour and taste.

EXPERIMENT XXV.

Jalap being triturated in the same proportions,

Number 1 dark brown; taste of the jalap strong.

Number 2 pale yellow; taste of the lime predominant, though that of the jalap perceptible.

Number 3, colour not quite so high as number 1, but equal in taste.

EXPERIMENT XXVI.

The result of the same trial with ipecacuanha was, that number 1 was of a light brown colour, tasting highly of the ipecacuanha.

Number 2 was of a deep yellow, having the same disagreeable taste of the lime complained of in the other tinctures, but that of the ipecacuanha scarcely perceptible.

Number 3 produced a tincture of the colour of red port wine, strongly flavoured with the ipecacuanha, though it had not so much of the distinguishing sharpness of that root as number 1.

EXPERIMENT XXVII.

The different tinctures of rhubarb, prepared in the same manner as above, had the following appearances:

Number 1 brown, with a yellowish tinge, strongly impregnated with the taste of the rhubarb.

Number 2 deep yellow, taste of the lime as in the other tinctures prepared with it.

Number 3 crimson; taste of the rhubarb strong, but unequal to number 1.

None of the tinctures prepared with lime water grew turbid from a stream of fixed air being conveyed into them.

Hence it appears that the triture of quick-lime with all the above roots did not in the least degree promote, but rather impede their solution in water; that lime water extracts the soluble parts of many, and especially their colouring principles, more powerfully than distilled water; but that this is by no means always the case, as in three instances out of six, the tinctures prepared with distilled water exceeded those with lime water in taste, and in two instances were superiour, and in one equal in colour.

CHAP. IX.

ON THE COMPARATIVE ANTISEPTIC POWERS OF VEGETABLE INFUSIONS PREPARED WITH LIME, &c.

SIR John Pringle, in the Appendix to his excellent Observations on the Diseases of the Army, allows lime water to possess but a slight antiseptic quality. Doctor Macbride on the contrary asserts, that it has great power in resisting putrefaction, but at the same time acknowledges that it destroys the cohesion of the constituent particles of animal substances, and therefore cannot be called a *true* antiseptic, as it absorbs the fixable air from them, and only preserves them sweet by confining it within their texture, into which the lime is enabled to insinuate itself in this dissolved state. As even this effect, if possessed by the tinctures of the antiseptic vegetables prepared with lime or its water, would be an objection to their administration in putrid diseases, I resolved to determine by experiment, how far their antiseptic powers were increased or diminished by this mode of preparation: and I thought it probable, as those prepared with the latter contain no lime when filtered, and yet in the extraction of the tinctures the vegetables are deprived of, at least, a part of their air, they might be rendered less able to resist putrefaction than either the infusions prepared with distilled water, or those with the addition of quick-lime. How far this reasoning was just, the result will discover.

EXPERIMENT XXVIII.

Pieces of beef, each weighing about two drachms, were separately infused in the different tinctures of Peruvian bark, snake root, Columbo, and contrayerva, prepared with lime, lime water, and distilled water, as in the preceding experiments; and the bottles containing them were exposed for two days to a degree of heat equal to that of the human blood. They were afterwards suffered to remain without any artificial heat, the temperature of the air being warm. The tincture of Columbo prepared with quick-lime was the only one not tried, the bottle containing it having been broken.

After thirty-six hours infusion they were all sweet, except the infusion of Columbo in distilled water, which began to emit a disagreeable, though not putrid fœtor. The beef in it, and in the tincture of the same root in lime water, was swelled, and whiter than before infusion. That in the tincture of bark prepared with quick-lime, had its texture greatly destroyed, was of a chocolate colour, but sweet. That in aqua calcis, the same in colour, shrivelled, firm, and sweet. The pieces of beef in the tinctures of snake root and of contrayerva with quick-lime, had more the appearance of calf's lights than of beef, were quite spongy, but had acquired no putrid smell. Those in the lime and distilled water, firm, and shewing no signs of putrescency.

On the fifth day the infusion of Columbo in lime water was very offensive, though the beef when taken out of it was not putrid. That of the same root with distilled water had made no further progress. The tincture of snake root in distilled water was grown turbid, and had lost colour, which it seemed to have imparted to the beef. This and all the others continued sweet.

On the tenth day the beef in the distilled water and Columbo, as on the fifth. That in the lime water and Columbo, putrid.

The contrayerva infusion in distilled water had acquired a disagreeable fœtor, but the beef was not yet putrid. That with lime water and that with quick-lime still sweet.

The infusion of bark with distilled water smelled rather musty; the beef in it sweet. The two infusions of the same with lime and lime water shewed no further change.

The tincture of snake root in distilled water had a scum on the surface; beef not putrid. The other two tinctures of the same root unchanged.

On the eleventh day, the beef in the infusions of Columbo and of contrayerva in distilled water beginning to putrefy, and

On the fourteenth day, both entirely putrid. The infusion of bark in distilled water mouldy, but the beef sweet.

The beef in the snake root and distilled water, putrid on the sixteenth day; and the infusion of contrayerva with lime water beginning to be offensive, but the beef in it not yet putrid; but

On the nineteenth it was quite putrefied. The snake root infusion in lime water, mouldy on its surface; no change in the beef; but this likewise became putrid in a few days more.

The remaining tinctures, viz. those of the bark, snake root, and contrayerva with quick-lime, and that of the bark with lime water, remained above five weeks without any further change. Some time after, the beef in the snake root became septic. The other three were unaltered at the end of six weeks from their first immersion; and though the infusion of bark in distilled water was very mouldy, the beef in it was free from any putrid fœtor. But it should be observed that all the tinctures in the preparation of which quick-lime had been added to the lime water, had a peculiar odour during the whole time, from which the others were exempt.

From this experiment we may conclude that lime water, when used in such a quantity in extracting the virtues of vegetables, as not to be saturated with the fixed air it receives from them, *strongly* counteracts putrefaction, though it at the same time destroys the texture of animal bodies exposed to its action. But when employed for the same purposes, in such proportion as to be fully saturated with air; it abstracts nothing from, but rather increases the

antiseptic power of the vegetable; nor does animal flesh immersed in tinctures thus prepared, suffer any diminution in the cohesion of its fibres.

CHAP. X.

ON THE SWEETENING PROPERTIES OF FIXED AIR.

THE very curious fact, that fixed air not only preserves bodies from becoming septic, but is also possessed of the power of restoring sweetness to them when actually putrid, seemed to be established by a number of very accurate experiments adduced in support of the doctrine by its ingenious author. This has, however, lately been controverted by a learned writer, who has favoured the public with *an Experimental Inquiry concerning the causes which have been generally said to produce putrid diseases*, in which he has recounted several experiments, in direct contradiction to those of Dr. Macbride. The authorities of both these gentlemen deserve considerable attention, and it might seem presumption in me to attempt to decide between them, had I only my own opinion to adduce; but as the accuracy of the following trials was witnessed by a Physician, well known for his medical and philosophical writings, I feel the less diffidence in submitting them to the public. They were made with a view, only, to my own information, having in one of the former chapters recommended Magnesia to be taken in the act of effervescence with an acid, as a corrector and evacuant of putrid bile; but as the event appeared to be so satisfactory, and as a determination of this point is the more important, from the late introduction of fixed air as an article of the *materia medica*, I hope I shall not be deemed to have impertinently obtruded into the dispute by relating them, and endeavouring to point out what, probably, has been the cause of Dr. Alexander's drawing conclusions, so contrary to those of the other celebrated experimentalist.

In the experiments which Dr. Alexander has related in support of his opinion, he has made use of the following methods. He included pieces of putrid mutton in bladders, one containing *four ounces in measure* of fixed air from fermenting wort; another the same quantity from wort with a piece of putrid mutton in it; and the third, only *about half the quantity* from a mixture of bread, water, and saliva. In another experiment, he exposed a slice of beef that had just begun to have the putrid smell, to a stream of air brought over from an effervescing mixture of distilled vinegar and salt of wormwood. In a third, the putrid flesh was suspended in the neck of a wide mouthed bottle, while *four ounces* of distilled vinegar were made into *spirit. minderer*. In a fourth, *four ounces* of air from bottled small beer were confined twenty-four hours with the putrid substance, which in a fifth experiment was put into the neck of a bottle of small beer, while it fermented before the fire for half an hour. In a sixth, the septic body was included in a bottle with *eight ounces* of air from an effervescing mixture of common vinegar and salt of hartshorn. In one only, out of all these experiments, he found the beef in any-wise sweetened, and even in that single instance, though he at first thought the piece a little changed, yet when washed it recovered its putrid smell. However he confesses, that by bringing over fixed air from several other fermenting and effervescing mixtures, on pieces of meat just beginning to putrefy, they were rendered a little sweeter, though never to such a degree, as entirely to lose their putrid taint.

So very different an account of so interesting a subject was truly mortifying: The old adage, *experientia fallax, judicium difficile*, seemed to be too applicable to the present occasion. Some cases, in which fixed air used medicinally as an antiseptic, appeared to have produced good effects, had occurred to some of my medical friends^[v], and I even flattered myself that I had directed it to good purpose in an instance or two. But if the theory on which this practice was founded should be false, the whole superstructure seemed likely to be destroyed. On revising Dr. Alexander's book, I imagined that I had discovered some thing in the conducting of his experiments, which might account for their terminating so differently from those of Dr. Macbride.

The largest quantity of fixed air which Dr. Alexander made use of in any of these experiments was *eight ounces in measure*, and in one instance, only two ounces were employed to sweeten the putrid substance. In that where the meat was suspended in a wide mouthed bottle while the vinegar was made into *spirit. minderer*. no method seems to have been taken to retard the too rapid flight of the fixed air, which, from the quick distribution of the salt, would be soon dissipated. From hence I suspected, that a larger atmosphere, or a longer continued stream of fixed air might be requisite to restore septic bodies to perfect sweetness; and in order to decide this point, the following experiments were instituted, having previously obtained some slices of beef so exceedingly putrefied as to render the fœtor of them scarcely tolerable.

EXPERIMENT XXIX.

A bottle capable of containing three pints was filled with water, and inverted into a bason of the same; a tube which communicated with another bottle, in which was an effervescing mixture of chalk and oil of vitriol, was then introduced into the mouth of the former, and a stream of fixed air continued, till the whole of the water was driven out by it. A piece of the above-mentioned putrid beef, fastened by a string to a cork, was conveyed into the bottle, which was corked before it was taken out of the water. The beef, after having been suspended in this atmosphere of fixed air for thirteen hours, was very considerably, though not entirely sweetened. *But the air in the bottle seemed to have acquired all the putrid smell of which the flesh had been deprived*. Another slice of the same beef was not at all sweetened by exposure, during the same time, to the open air.

EXPERIMENT XXX.

A piece of this beef suspended all night in the neck of a bottle of artificial Pymont water^[w], was rendered less putrid, though not near so much altered as that in the foregoing experiment. The

water was strongly impregnated with the putrid effluvia.

EXPERIMENT XXXI.

Two drachms of Magnesia Alba diluted with two ounces of water were placed in a quart bottle, to which was added a sufficient quantity of the strong spirit of vitriol to let loose all the fixed air from the Magnesia, during the separation of which, another equally putrid piece of beef was suspended in the bottle, which was so corked as to retard, though not totally prevent the escape of the air. Another piece of the same beef, was exposed in like manner to the vapour arising from the addition of oil of vitriol to two drachms of chalk diluted with water. They were suffered to remain for twenty two minutes, and being then examined were absolutely free from any putrid foetor, and though well washed in water continued quite sweet.

EXPERIMENT XXXII.

Air expelled from Magnesia by the nitrous acid, sweetened a piece of the same putrid flesh suspended in the neck of the bottle during the effervescence. The beef smelled of the nitrous acid, but remained equally sweet when washed from it in water. Very little change was produced in another piece exposed to the smoaking spirit of nitre.

It may be some additional evidence in support of the sweetening properties of fixed air, to declare that the highly offensive, sanious discharge of a cancer has been rendered considerably sweeter by it^[x]; and that I have seen a case of a dysenteric fever, attended with extremely foetid and bloody stools, in which fixed air was directed, by the Physician who attended, to be thrown into the intestinal tube by way of clyster; the consequences of which were the correction of the putrid smell of the discharges, and the reduction of the inflation of the abdomen, together with contributing considerably to the ease of the patient after each injection of air^[y]. A third case of this kind has very lately occurred to Dr. Percival, in which the injection of fixed air removed the foetor of the stools, and the patient recovered without the assistance of any other medicine, except the moderate use of wine as a cordial, and of a decoction of Peruvian bark during the convalescent state. I have also experienced the removal of a very large and deep slough, and the healing of the ulcer in the putrid sore throat, more expeditiously by the inspiration of fixed air than by any other method.^[z]

One circumstance in the twenty ninth experiment peculiarly attracted my attention, viz. that the air in the bottle was so very putrid, though the beef exposed to it was restored to sweetness. The septic effluvium therefore did not appear to be destroyed, but to have changed place. From this fact it occurred to me that there might possibly be an affinity between the fixed air and the septic particles, and that this air might act as a menstruum on the effluvia emitted by putrid bodies. I have since had the pleasure to see that Dr. Priestley, whose investigation into the nature of factitious air has lately been laid before the Royal Society, and must contribute to exalt him to a still higher rank as a Philosopher, has taken notice of something similar hereto. I am sensible that difficulties attend this theory. Doctor Percival, in the second volume of his Essays, which is now in the press, has offered some ingenious conjectures on the subject, and to them I refer the reader. I shall only mention one experiment which seems to give some force to this doctrine.

EXPERIMENT XXXIII.

Slips of linen cloth dipped in very rancid oil, had their rancidity much diminished by exposure to a stream of fixed air from an effervescent mixture of chalk and spirit of vitriol. But a pint bottle of the same oil being saturated with this vapour, was equally offensive as before the air was thrown into it, though the oil appeared to absorb a considerable quantity of air.

Dr. Macbride exposed a piece of rag dipped in lixivium tartari, and another tinged blue by the scrapings of raddishes, to the vapour arising from a large vat of melasses wash in high fermentation, without any change being effected in either, which could be supposed to proceed from an acid vapour. But as water impregnated with fixed air has evidently an acidulous taste, and it seemed probable that some of the vitriolic acid might be volatilized during the effervescence which proceeds from its admixture with the alkaline body, when the air is procured from these substances, it was apprehended that the antiseptic and sweetening powers of air thus obtained, might depend on the acid contained in it. In order to evince how far this conjecture was just, Doctor Percival was so obliging to assist me in suggesting and making the following experiments.

EXPERIMENT XXXIV.

Twenty drops of syrup of violets mixed with a glass-full of water were changed into a lively red by the addition of one drop of dilute spirit of vitriol. The season of the year did not allow us to use the fresh juices of vegetables, but this trial shews the genuineness of the syrup of violets, and that it was a sufficiently delicate test of acidity.

EXPERIMENT XXXV.

A paper besmeared with this syrup, was placed over a vessel which contained an effervescing mixture of chalk and oil of vitriol. No change of colour took place except in one small point^[aa], which had probably been accidentally touched by the vitriolic acid.

EXPERIMENT XXXVI.

Twenty drops of the syrup of violets were added to a glass-full of water strongly impregnated with fixed air, after the method directed by Dr. Priestley^[ab], but without any variation in the colour of the violets.

EXPERIMENT XXXVII.

A few drachms of the syrup of violets were dissolved in half a pint of water, which was afterwards impregnated with air from an effervescing mixture of chalk and the smoaking spirit of nitre; but the syrup of violets suffered no change of colour.

EXPERIMENT XXXVIII.

A piece of putrid flesh which had been sweetened by the vapours of iron filings and the nitrous acid, had a pungent, acidulous smell. It was carefully washed in water, and still remained free from putridity. A few drops of lixivium tartari were instilled into this water without producing any sensible effervescence.

May we not infer from these experiments, that if fixed air be an acid, it is an extremely weak one, and not sufficient, as such, to sweeten putrid bodies; which effect must consequently be owing to some other mode of action, the principles of which are not as yet positively defined?

CHAP. XI.

A REVIEW OF THE GENERAL CONCLUSIONS DEDUCIBLE FROM THE FOREGOING OBSERVATIONS AND EXPERIMENTS.

1. **T**HE due preparation of *MAGNESIA ALBA* depends on the proper mixture of the alkaline lixivium with the solution of the *sal catharticus amarus*; on the precipitated powder being immediately thrown into a very large quantity of boiling water; on the purity of the water used in the process; on the expeditious drying of the medicine, and on an exact attention to cleanliness.
2. The artificial Epsom salt, or *sal catharticus amarus*, affords Magnesia, at least, equally pure with that obtained from the Epsom waters; and as the writers^[ac] on mineral waters mention those of Epsom to contain besides their salt, a considerable quantity of unneutralized earth, which appears, from Dr. Rutty's experiments, to be calcareous, they should seem peculiarly unfit for the purpose of preparing Magnesia. Some of the *Epsom Magnesia* being calcined, impregnated distilled water with a calcareous earth.
3. A sufficiently strong and well purified lixivium of potashes is equally adapted to procure the precipitation of Magnesia, as a ley made with salt of tartar, or any other fixed alkali.
4. *MAGNESIA ALBA* differs essentially in its chemical and medicinal properties from every other known absorbent earth; and when mixed with an acid, either before or after its admission into the stomach, is *purgative in a much smaller quantity* than chalk, crab's eyes, or any of the calcareous or testaceous earths.
5. The calcination of Magnesia divests it of those disagreeable properties complained of by Hoffman, and other practitioners; the fixed air which constitutes so great a share of its composition, and is the cause of the uneasy sensation produced by this powder, being expelled in the process. But depriving the Magnesia of its air does not render it caustic or unfit for internal uses.
6. It is a common, but unchemical practice, to mix acid and alkaline substances in the same composition, without attending to the changes which will be produced in their nature by being united. Among other instances of this kind which might be pointed out, we often meet with lenitive electuary, cream of tartar and Magnesia Alba prescribed together in one medicine, the consequence of which is, that the Magnesia is not only unintentionally neutralized, but the effervescence produced in it by the acid occasions the electuary to swell and renders it unsightly, besides altering the nature of the pulps and syrup which enter the composition, by inducing a vinous fermentation in them. The calcined Magnesia being a non-effervescent may be united with acids under this form without any other inconvenience than their producing a neutral salt, and the propriety of this change must depend on the intention of the prescriber.
7. It appears that Magnesia Alba, though remarkably septic to animal flesh, retards the putrefaction of bile, and restores sweetness to it when actually putrid: That these last effects are still more strongly produced by the calcined Magnesia, which also powerfully resists the corruption of flesh: That some of the other absorbents prove antiseptic to bile; and consequently that the opinion of the universal septic property of the absorbent class of medicines, and of the impropriety of prescribing them in bilious diseases, may admit of some exceptions.
8. Magnesia, when calcined, has the same property as quick-lime of promoting the solution of resinous gums in water.
9. The increased power of water as a menstruum to vegetable astringents, depends on only such a quantity of lime being employed as can be saturated with air by the *solvend*; but if a larger proportion be used, the action of the water on the vegetable is rather prevented than promoted.
10. Though lime water in several instances appears to be a more powerful menstruum to vegetables than distilled water; yet the latter is sometimes preferable, and acts more efficaciously than when impregnated with lime.
11. Antiseptic vegetables yield tinctures to lime water, which resist putrefaction more powerfully than those prepared from the same drugs with distilled water, without lessening the cohesion of animal fibres.
12. Waters which contain a large quantity of calcareous earth, either simply suspended, or in a neutralized state, are highly improper for pharmaceutical purposes in general, and especially for the preparation of extracts, where much water and long continued boiling are requisite.
13. The power of fixed air to restore sweetness to putrid bodies, is, it is hoped, clearly established: and there appears to be some degree of probability, that fixed air produces this effect by acting as a menstruum to the putrid effluvia: It seems also to be proved, that its antiseptic quality is not owing to any acidity which it carries off with it from the effervescing mixture.

THE END.



AN APPENDIX

TO

Experiments and Observations

On the PREPARATION of


MAGNESIA, &c.

CONTAINING

Strictures on Mr. GLASS'S MAGNESIA.

By THOMAS HENRY, Apothecary.

Manchester, March 8, 1773.

T is with the utmost reluctance I find myself indispensibly obliged to address the public on a subject, from the nature of which I may perhaps incur the suspicion of acting from interested views: should I be so unhappy, my friends who know me will, I trust, do me the justice to acquit me of the charge of being influenced by any improper motives; and I shall hope for the candid indulgence of those persons to whom I am a stranger.

About a year and half since I transmitted to the College of Physicians an account of a method of preparing Magnesia Alba, equal to that which had been long sold by Mr. Glass of Oxford, and which was generally and deservedly esteemed by others, as well as by myself, to be the standard of purity. Though that gentleman carefully concealed the minutiae on which the success of his process depended, he had always prepared it with the most laudable attention.

My process was received by the College, and published in the second volume of the Transactions of that truly respectable society, and has since been reprinted in a pamphlet which I lately published, and in which, among other subjects, I have recommended Calcined Magnesia to the attention of the faculty, as a medicine of considerable importance.

Notwithstanding I had been informed, by a relation of Mr. Glass, that he had disposed of his name in the Magnesia business to some persons, for a very valuable consideration, yet I doubted not their adhering to the proper manner of preparing it; but as I have since had occasion to change my opinion, and as the credit of the Calcined Magnesia depends so much on its purity before calcination, I am necessitated to take this method of informing the public of my reasons for declaring that sold under the name of Mr. Glass to be impure, calcareous, and improper for the purpose of calcining.

Two or three years had elapsed since I had seen any of Mr. Glass's Magnesia, except a small quantity which I had preserved, as a standard for the levity of what I prepared myself. But having a mind to calcine some of his, in order to compare it with my own, I sent for a box from Mr. Harrop, an agent of the proprietors in this town. I was surprized, on opening it, to find the Magnesia specifically lighter, to an amazing degree, than any I had formerly seen, insomuch that the six shillings box, which used to contain about four ounces, now only contained an ounce and half, Troy weight: *so that this medicine is sold at the rate of two pounds eight shillings the Troy pound, which is not fourteen ounces Avoirdupois.* On attempting to dissolve it in the vitriolic acid, I found the solution very imperfect; and on calcining half of the contents of the box, it was with indignation that I discovered this Magnesia, so extolled, so puffed in every newspaper, for *its superior purity and goodness*, to contain no inconsiderable quantity of calcareous earth; for the pungency of it was very disagreeable in the mouth, and one scruple of it impregnated an ounce of water almost as strongly as so much lime would have done. These are tests, which, tho' much stronger than that of levity which the proprietors have artfully placed as the principal one, they have avoided mentioning, being sensible of its deficient solubility, and that it would not stand the FIERY ORDEAL.

Willing, however, to believe that this impurity might be accidental, though I had reason to think, from the artful conduct above alluded to, that it was not so, I sent for a box of Magnesia, from the agent for the sale of Mr. Glass's Magnesia at Preston. This likewise proved calcareous, though I thought the lime, produced by calcining it, not quite so pungent as the other; it, however, made a strong lime-water. That I might avoid drawing too hasty conclusions, I procured a third box from Chester, which being subjected to the same trials, seemed more impure than either of the other two. This Magnesia formed a very imperfect solution in the vitriolic acid; and the taste of the lime, after calcination, was so very disagreeable, that I was not free from it for some hours. The water impregnated with it was as strong to the taste as common lime-water, and the precipitate which fell from it, on blowing air into it, was as copious as I ever observed from that prepared with stone or oyster-shell lime. The boxes were all purchased from the agents for the sale of Glass's Magnesia, and every box was sealed with his arms, and had every other mark of authenticity. I have retained samples of each in both states.

I have since repeated the above experiments on the contents of two boxes of Glass's Magnesia,

the one of which was purchased of Mr. R. Davis, in Sackville-street, Piccadilly, the other of Mr. William Nicoll, in St. Paul's Church-yard. The Magnesia in each proved to be calcareous, and acquired the properties of quick-lime by calcination.

It would be natural for every person, who might wish to give the Calcined Magnesia a fair trial, to obtain Mr. Glass's for that purpose, on the supposition of its being superior to any other; and as the very first taste of it, in that state, would be sufficient to prejudice any one against the farther use of it, I am necessitated, in justice to my own reputation, and to the public, who may otherwise be deprived of a very valuable medicine, to enter this protest against the use of it.

I have fairly and candidly given up to the public what I have found to be the best method of preparing Magnesia, sufficiently pure for every medical and chemical purpose; and I sincerely wish that every apothecary, who has opportunity and leisure, would prepare it himself. But as, from various reasons, there are, I am convinced, too many who omit to do it, and that too little attention is paid to examining into the purity of what is used; and as it also appears the public have been imposed on, where they had reason to think themselves most secure, I have sent to Mr. JOHNSON, No. 72, St. Paul's Church-yard, and Mr. RIDLEY in St. James's-street, a quantity of Magnesia, both in a calcined and uncalcined state, which, though not EQUAL IN LEVITY, nor quite so costly, even when calcined, as that sold as Mr. Glass's, will, I doubt not, prove to be non-calcareous, and superior to it in every other respect. And if it should appear so to the gentlemen of the faculty, I wish for no preference to those apothecaries who prepare the medicine faithfully; but flatter myself that I have a superior title to the favour of physicians, of my brethren, and of the community, than those persons can claim, who have meanly stooped to secrete a process, the knowledge of which must be beneficial to mankind, and have abused the public confidence.

I shall only add, that so far was I from expecting to find Mr. Glass's Magnesia impure, that I bought it as a standard; that, as I am informed that Gentleman is dead since this inquiry was finished, nothing, less than the reasons I have adduced, could have prevailed on me to have published this Appendix at this season; and that I do not consider him, but the present preparers of the Medicine, as culpable for the adulteration. That I have been favoured with an account of some experiments made by a Physician of considerable eminence, on that Magnesia, the result of which was similar to what I have here recited; and I appeal for proof of the truth of what I have asserted, to every reputable person who may now have any of it in his possession, and will make the experiment; and that having rested my cause on that issue, I mean not to enter into any controversy on the subject.

N. B. Calcareous Magnesia is neither so absorbent, nor so purgative as the pure.

FINIS.

FOOTNOTES:

[a] The German and Italian chemists formerly prepared Magnesia by evaporating the mother of nitre, and then calcining the residuum; but, Hoffman having discovered the method of precipitating it from the bitter remaining after the crystallization of sea salt, the calcination was disused, as tedious and unnecessary.

[b] Essays and Observations Physical and Literary, Vol. II.

[c] Mr. Glass, a few years since, published an Essay on Magnesia Alba, in which all the information he affords us relative to the preparation is what we knew before, viz. that it is prepared from Epsom salts and pot ashes; and has related a number of difficulties which occur in the process, at the same time carefully, I had almost said meanly, avoiding giving the least instruction which might teach us how to shun them, though he has given a long detail of the many tragical consequences which may attend the use of Magnesia prepared under such disadvantages.

[d] Essays Physical and Literary, Vol. II. p. 164.

[e] Ibid. p. 64.

[f] Hoffman, having attributed the purgative quality of Magnesia to its forming a bitter cathartic salt with the acid it meets with in the stomach and bowels, adds, "At vero in contrarium quoddam dubium contra hanc sententiam moveri posse intelligo, quum nempe alia terrea, quæ prompte solvent et absorbent inhærescens primis viis acidum, neutiquam effectum laxantem exerant. Sed his regerere licet, quod interdum a pulveribus absorbentibus vel bezoardicis utique alvus fluidior fiat, si multum acidi primam regionem incolet: vis tamen eorum purgandi non tanta est, quanta magnesiæ, quia solutiones illorum cum acidis liquoribus factæ non tam eminente salino acri, sed moderate salso sapore imbutæ sunt, quam quidem ea, quæ ex magnesia et acidis liquoribus conficitur. Atque adeo ex eo apparet, præter alcali terreum aliud adhuc esse in magnesia principium, quod ad mixturam acidi in materiem stimulantem et purgantem transeat."

Hoffman. Animadversiones et experimenta
circa Magnesiam, &c. Op. Tom. 4. p. 480.

[g] Alston's Materia Medica, Vol. I. p. 164.

[h] Ibid.

[i] Essays Physical and Literary, p. 163.

[j] Vide Percival's Essays, 2d. Edit. p. 321.

- [k] Ibid. p. 87.
- [l] Hactenus monstravimus, sicut cordis, musculorumque vires debiles erant, ita et solidorum quoque statum necessario imbecillum fuisse, et succos tenues, dilutosque; ut natura ampliacionem vasculorum facilius efficeret, et incrementum animale minori cum molestiâ perageret. Sed ne status iste tonusque partium debilis latusque ultra modum procederet (quod sæpe accidit, morbosque excitare solet) acidum quoddam juveniliū animalium stomachis datum est, quod quamvis aluminis instar, lac coagulat, atque ob eam causam aliquando morbum procreat, tamen fibrarum tonum astringet confirmatque, et putredinem omnem alkalīnam, a qua alioquin periculum esset, reprimit. Quod quidem videri est, vel in coagulo stomachi vitulini, vel in aliis animalibus: sed istud tamen acidum, quod infantibus tarn idoneum est, redundat fortasse nonnumquam, et vel per testaceas pulveres, vel per medicamenta antiacida, ut supra dixi, corrigi debet.
- Russelli Œconomia Naturæ, p. 56.
- [m] Medical Observations and Inquiries, Vol. III. p. 335.
- [n] Neque enim tantum absorbentem et catharticam, si acidum primâ in regione stabulatur, virtutem exserit; verum etiam si in remissione dosi, ad grana xv. vel xx. usurpatur, diaphoreticum et diureticum effectum sequi, non semel observavimus.
- Hoffman. circa Magnesiam. Oper.
Tom. 4. p. 481.
- [o] The reader is referred for further information on this subject, to an excellent Treatise on the Management of Pregnant and Lying-in Women, lately published by my worthy and ingenious friend Mr. White; to a volume of Experiments and Observations, by Dr. Percival, which is now in the press; and to some very curious papers on factitious air, which have lately been communicated to the Royal Society, by Dr. Priestley.
- [p] In making this experiment some time since, I imagined that Doctor Black had been mistaken in this point, and that some impurity in the water had prevented the success of his process, for I found the water impregnated, as I supposed, with the Magnesia. Flushed with my supposed success, I proceeded to make experiments on the lithontriptic powers of this water, which I found to be very considerable, acting more efficaciously on the human calculus, than either oyster-shell lime water, or a dilute solution of soap ley. I communicated this interesting intelligence to some of my medical friends; but on repeating my experiment several times with different parcels of Magnesia, that the truth of the fact might be absolutely ascertained, I at last was convinced, to my no small mortification, that what I had too sanguinely flattered myself to be a discovery likely to be highly serviceable to mankind, was founded on error; and that the properties communicated to the water proceeded from some calcareous matter which the Magnesia had received by being washed with impure water. I mention this as a caution to every young experimentalist, to be extremely careful in drawing conclusions. However, as something may be learned, even from an unsuccessful experiment, it proves that a very small quantity of lime is sufficient to impregnate a large quantity of water; for I used the calcined Magnesia, in the same proportion as lime is directed for making lime-water, so that very little of it could be quick-lime. And as oyster-shell lime water is a superiour solvent of the calculus to the water prepared with stone lime, is there not some reason to think that the calcareous earth, which has been dissolved in hard water, may, when calcined, be a more powerful lithontriptic, than either of the others? If any inference can be drawn from it, which may in the least promote the interests of mankind, I shall be sufficiently recompensed for the humiliating circumstance of recounting an erroneous experiment.
- [q] Neque tamen præterire possumus, id incommodi nos quandoque ab hoc Magnesiae pulvere deprehendisse, quod flatulentias et morsicationes in imo ventri reliquerit, si videlicet frequentius in usum trahatur, primaque regio progignendis corrosivis succis, ut in hypochondriacis fieri solet, exposita sit.
- Hoffman. Oper. Tom. 4. p. 381.
- [r] I at that time overlooked an experiment of Dr. Macbride's which proves Magnesia to be septic to *animal flesh*; but having met with it just before these papers were going to the press, I take this method of acknowledging it.
- [s] Doctor Macbride found that *pulv. e chel. c. c.* hastened the corruption of bile: might not this depend on some variety in the composition of that powder? Chalk and oyster shells are often substituted in the hospitals and by the druggists, for the other ingredients.
- [t] Vid. Lectures on the Materia Medica, as delivered by William Cullen, M.D. p. 195.
- [u] Percival's Essays Medical and Experimental, 2d Edit. p. 65.
- [v] See Dr. Percival's Experiments and Observations, p. 72; Dr. Priestley's papers on factitious air; and Mr. White's Treatise on the Management of Pregnant and Lying-in Women, p. 203.
- [w] See Dr. Priestley's Directions for impregnating Water with fixed Air.
- [x] Directions for impregnating Water with Fixed Air, by Joseph Priestley, L.L.D. F.R.S.
- [y] This case, together with another similar to it, will probably appear more fully in the next volume of the Philosophical Transactions, with Dr. Priestley's papers on factitious air.
- [z] The patient in this last case being a lady in the country, at such a distance that I could not frequently visit her; by continuing to inspire the fixed air, after the ulcer was cleansed, and in a healing state, brought on a considerable inflammation of the fauces.

[aa] In making this experiment, if the vegetable juice be placed too near to the effervescing mixture, some particles of the acid will be forced up to it, together with the air, and may occasion an erroneous conclusion to be drawn from it.

[ab] Directions for impregnating water with fixed air, &c. by Joseph Priestley, L.L.D.

[ac] Allen, Lucas, Rutty, Monro, &c.

Transcriber's Notes

Obvious typographical errors have been corrected but variations in spelling, punctuation and hyphenation have been retained. In particular, the phrase "head achs" in Chapter III. has been retained.

Experiment I was erroneously numbered II. This has been corrected.

The reference to AN APPENDIX has been added to the Table of Contents.

The Errata listed have been corrected in the text.

*** END OF THE PROJECT GUTENBERG EBOOK EXPERIMENTS AND OBSERVATIONS ON THE FOLLOWING SUBJECTS ***

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