On Chloroform

by

Alexander Monro Inglis
Somne laes, quamquam certissima matris image
Consuentur cupris te tenerem esse tori.
Alma quies, optata, veni, nomen die cerni
Vincere quam saepe est, hic sine more mori.

Warton.

"Come gentle sleep, attend thy mother's prayer,
And, though death's image, to my work repair.
How sweet, though lifeless, yet with life to lie
And without dying, oh! how sweet to die."

Milton.
Preface

Choosing Chloryton as a subject for a thesis, my object has been to give an epitome of what is known regarding it. By consulting the various journals, I have collected the opinions of those who have written on the subject. There are some points still disputed, and I have attempted, by making a few experiments, to prove the correctness of one or other doctrine. I have sufficient confidence in the gentlemen into whose hands this essay will pass, to know that they will make all allowance for one commencing to make observations, being aware of the great liability to fallacy, and therefore if I have gone astray in any of my theories, I trust to be considered in the light of a beginner.
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* From J. Simpson's lectures
History of Anesthesia

The idea of removing pain during surgical and other painful operations is by no means of recent date. It was attempted to be done in two ways, namely, mechanically, and medicinally. The mechanical methods went two kinds; first, that suggested by Ambrose Pare and revived by Dr. Monro of Glasgow in 1780, it consisted in compression of the principal nerve leading to the part. He induced John Hunter to attempt an amputation of the thigh after the nerve had been compressed. But the operation was not as successful as was anticipated;owing probably to the mistake which Hunter is said to have made in taking up the nerve instead of the artery, which certainly would not add much to the patient's comfort, if he did so. Hoffmann and Magagni proposed another mechanical plan, that of pressure upon the central arteries. Although at first light it would appear crude and barbarous, it is in a manner effective, and unfortunately this mode of inducing insensibility
Insensibility, it is too commonly practiced, it being the way by which thieves and assassins persons in the perpetration of highway robberies. Numerous writers, as Baptista Porta, Theophrast, Shakespeare, &c. have recorded various medicines which have been used to assuage pain. They were generally made up in the form of potions, ointments. These varied considerably in composition, but the essential constituent appear to have been Mandragora, opiates of opium, and Indian hemp. Salt, etc. mention that in Mores a custom prevails where any person is hung, or undergoes any severe bodily pain, they take a substance called Bang, which is the powdered leaves of Mandragora, this relieves the patient considerably. It is said that the Jews must have had some means of alleviating suffering, as instance of it is seen in the fiction which was given to our Savious; it is all likelihood it was a preparation of Indian hemp. The Greeks of Greece are said to have been able to prevent suffering by means of a potion which
which they were in the habit of using. History informs us of the use of Anesthetics in Midwifery, as well as in Surgery. Thesaurus tells us a case where a woman was delivered speedily, without pain. The witches in Aberdeen had a somewhat humorous mode of practising. It is said they stuck a sword into the wall and directed the woman to look intently at it during labour, and that this had the effect of keeping away suffering. If a sword was not at hand, the husband washing up, and the woman made to look steadfastly at him, it is said with the same good effects. How far these statements are true, it is difficult to say, but certain it is that they must have had some means of relieving pain, as many trials took place, and in some instances, both the Witch and the Woman whose sufferings she relieved, were condemned to the burn. The depiring women of consciousness gave rise on one occasion to a trial of no ordinary interest. It was the case
* Vice American Journal of Med Science
for Janur 1867
of the Countess of St. Geran, who was delivered in a state of insensibility, having received from the midwife some thing which caused her to sleep half an hour. This gave the suspicion, and it came to be contested whether the child that had been reared up was the lawful heir. The court after hearing the evidence decided that he was.

*If we trace back the course of modern anaesthetics we find the first attempts were made with gases. Sir Humphrey Davy, in the commencement of this century, made numerous experiments on the inhalation of various gases, and among them the nitrous oxide. He found that when this gas was inhaled, it produced exhilarating effects, causing laughing and general excitement; hence it is commonly known under the name of laughing gas. During this excitement the person was liable to knock himself against anything within reach, and sometimes struck violently with his fists, but felt
no pain. He therefore inferred it might be used to relieve pain. Sir Humphry Davy was also aware that chloroform Ether could be used, too, to cause sleep and unconsciousness. Dr. C.J. Jackson, who was an intimate friend of Dr. Davy, and had often been with him when he was performing his experiments upon gas, became impressed with the idea, that chloroform Ether might be useful in relieving pain. He mentioned this one day to a former pupil of his Dr. W.T.G. Morton, a dentist in Boston, who was struck with the remark and let to work immediately constructing an apparatus through which it might be inhaled. Having made an apparatus, he inhaled it just himself, and finding it succeed, asked a patient to try it, which he did, and had a tooth extracted without suffering pain. As the experiment was so successful, he went to the hospital at Boston, and asked Dr. J.C. Warren to perform an operation, having the patient under the influence.
of Sulphuric Ether. This he accordingly did, excising a tumour from the head with perfect success, and from that time Sulphuric Ether came into general use as an Anaesthetic. It is to Dr. Morton therefore that we are indebted for the application of it for this purpose. But whenever a discovery of any importance is made, there are never wanting men who come forward to lay prior claims to the discovery. This one was no exception to the rule. Numerous men came forward. Dr. Jackson said that he had not been for his suggestion, Dr. Morton never would have dreamed of it. Dr. Horace Wells of Hartford, also a pupil of Dr. Jackson and partner of Dr. Burton, put in his claim, which happened to be that he was in the habit of using Nitrous oxide gas for the extraction of teeth, and, on one occasion (November 8, 1844), he tried Sulphuric Ether, but failing to produce insensibility, he changed it for Nitrous oxide, and there again attempted its use.
Dr. Richard Pearson was also another candidate. His claims consisted in his having used it, as a therapeutic agent, in some cases of Phthisis, Asthma, whooping-cough, Croup, and Catarrh. But he did no more than his neighbours, because in Paracelsus's Materia Medica 1693, Christian's Dispensatory, and many other works on the subject, Sulphuric Ether is stated to be used in Phthisic Asthma, Chronic Cataract, Dyspepsia, Hooping-cough, and to relieve the disagreeable effects caused by Chloroform gas. It is evident therefore that although Sulphuric Ether had been repeatedly used internally, Dr. Morton was the first to discover its true anaestheticising properties. His discovery led to the trial of other substances, to ascertain whether there were any others possessed of like properties. Dr. Simpson having tried many, one of which acted as Anaesthetics, at last hit upon Chloroform, which he found possessed the same properties in
via superior degree to Luf pluric Ether, and from that day to this it has succeeded the use of Ether, and is employed as an anesthetic all over the civilized world, with the exception perhaps of certain parts of America, where as might naturally be expected, they did not like to give up Ether altogether, as it succeeded as well at first, and to accommodate themselves boldly discovered, split the difference, using a mixture of Ether and Chloroform.
History of Chloroform

Chloroform, or Perchloride of Formol, was discovered by Dombey in 1831, who obtained it by distilling a mixture of alcohol and Chloride of lime, he gave it the name of Ether Bichlorique.

Liebig prepared it in 1832, and called it chloride of Carbon. It is said to have been obtained by Mr. Samuel Gutman of New York, by distilling a mixture of 3 lbs. Chloride of lime with 2 gallons of alcohol, 27 gr. 0.84 cc.

He supposed he had produced Chloride of Clorofor gas or Chloric Ether. It was trying to discover a cheap mode of preparing this substance, which led him to the experiment. He found the substance obtained by the distillation to be a grateful and diffusible stimulant.

An account is published in Sel- liman's American Journal for 1832, under the title of a new mode of preparing a spirituous solution of chloric Ether. He used it along with an equal weight of water.
water, and it produced intoxicating effects. The chemical composition was just ascertained by Dumas in 1834 and Béligné in 1835, who determined its composition, the former designating it chloroform. Dr. Glover of Newcastle was the first to perform experiments on animals with it. In an essay which he wrote in 1842 on bromine and its compounds, which was published in the 152nd number of Edinburgh Medical Journal, which gained the Hawaiian Prize, he relates some experiments performed on animals. When it was injected into the peritoneum of a rabbit, the following symptoms presented themselves. Slight transient excitement, loss of power over the limbs, suspend coma, excessively dilated pupils, heart action gentle, great excitement of the respiration, and dilatation of the chest, a few slight movements of the limbs, synchonous with the respiration, no motion could be excited by tickling or pinching the limbs, but
did the eyelids move on approaching an object to the eye. Similar experiments were observed on introducing it into the stomach of another rabbit.

Dr. Paré had used Chloroform some years before its anaesthetic effect was known, both in hospital and private practice. To relieve asthma, and other spasmodic affections. But it is solely due the credit of having first used it as an anaesthetic. Having tried many substances as Dutch Liquid, Bicarbonate of Carbor, Benmar, Nitrate of Silver, and alcohol, all of which are inferior to Chloroform. He tried the inhalation of it himself, along with the gentlemen at that time his assistant, Dr. Keith and Matthews Duncan. Finding it so successful, he went to the hospital, and requested Professor Miller to try it. According to boy telegraphed up. For two days nothing was put under its influence; the operation was performed, and the boy woke after everything had been completed.
quite unconscious of anything that had been going on. Like Ender, the priority of the discovery was disputed: our French brother claimed it as a discovery of his, having made some experiments manual with it in March the same year, eight months previous to Dr. Simpson, the late having experimented with in the beginning of November. But Dr. Flower was so far as far as Dr. Glover or his experiments, made many years previously, certainly went no farther, and however Dr. Flower and his few followers may take the credit of the discovery, it will ever rest with the true discoverer, Dr. Simpson, as he alone is entitled to the claim.
Chemical History

Chloroform may be obtained in many various ways, but there are few processes
among either to the expense of the process,
or the difficulty of getting it completely
free of all impurities, which it is absolutely
necessary it must be, before it can be
made use of as an Anæsthetic.

The following are some of the methods
by which it can be obtained.

1. By mixing chlorine gas with gaseous
chloride of methyl in a vessel, and con-
fining the bottle to the sun's rays.

2. By the decomposition of chloral, with
an excess of an aqueous solution of potash,
caustic soda, baryta, or milk of lime, separating it
from the water as completely as possible
by decantation, and distilling it with six
weight times its volume of oil of vitriol,
in a perfectly dry apparatus.

3. By distilling chloride of lime and
water along with wood spirit, the oil
which separates from the supernatant
watery fluid is mixed with oil of vitriol.
and afterwards rectified over finely powdered Bayta.

(4) Chloric gas passed through chalked line suspended in water till the greater part of the line has disappeared; milk of lime is then added in sufficient quantity to produce an alkaline reaction; the liquid becomes clear and is decanted; it is mixed with acetone and the mixture distilled. Chlorajoum distils over along with water, it is rectified with chloride of calcium and distilled with oil of balsam.

(5) Equal parts of acetate of potash and chloride of lime if distilled in an earthen retort, chlorajourm distils over along with water and is rectified over chloride of calcium.

(6) Certain oils, as oil of Immortelle, Bergamot, Copalina, and Peppermint, yield chlorajourm by distilling any of them along with chloride of lime suspended in water. The action is somewhat violent and there is great escape of Carboenic acid. The best mode at present known, as by it we can obtain a perfectly pure chlorajourm.
* see Christison's Dispensatory
Chloroform, at a moderate price, is the one prepared by Souleiman. It is the action of bleaching powder on alcohol.

One pound of crude fluid of bleaching powder, with three pounds of water, and three ounces of rectified spirit, yield by distillation in a copper vessel, about nine fluid drachms of crude chloroform having an density of about 1.220. If the distillation be continued longer, the mixture in the react begins suddenly to froth up. The impure chloroform which is covered in the receiver, is strained of a stratum of free spirit, is purified by shaking with it half its volume of sulphuric acid, gradually added, and water and alcohol being thus removed, the strong chloroform is freed of a little sulphuric acid. Redistilling it from milk of lime or Brava, the product of the process has been well conducted, pure chloroform, amounting to about half a fluid ounce.

This process is the one followed by Messrs. Duncan and Flockhart of this city, possibly they may have some slight modifications.
modifications, which you experience they have joined to answer letter. This firm probably manufactures more than any other establishment in the world and it is always of the finest quality. For the processes recommended by the London and Dublin Colleges see Bartia's Pratice Medicia. For a full account regarding the different methods for preparing album see Gmelin's Chemistry Vol V.3. Published by Cavendish Society.
**Properties**

It is a transparent and colourless liquid, having a bp. of from 149.7 to 1500 at 69.5°C. It quickly evaporates when exposed to the air, and when thrown upon a double filter, the rapid evaporation at the edges causes the remaining portion to solidize in white tufts. It boils at 140° and the density of the vapor is 4.2. When inhaled, it has a very pleasant penetrating, ethereal, apple-like odour, and an ethereal, sweet taste in the mouth. It does not burn, but communicates a dull, yellow, costly flame to burning alcohol. It is readily soluble in alcohol and ether, but only in 2000 parts of water to which however it imparts its strong, peculiar odour. It dissolves volatile oils, camphor, saeoucghone, wax, and resins.

According to Liebig, also phosphorus, sulphur, and iodine. Its formula is $C_2H_2O_2$ or $O_2C$, consisting of three equivalents of chlorine, united with two of carbon and one of hydrogen. Or if we take the two equivalents of carbon and one of hydrogen.
to represent Formyl, the derived radical of Formic acid, we have the three equivalent of Chlorine added which form the perchloride or more properly the perchloride of Formyl.
Adulterations

The impurities liable to be found in chloroform are alcohol, ether, chloroform, hydrochloric acid, and various empyreumatic oils. The admixture of anyone of these renders the specific gravity lower. Fouleiran says he finds that pure chloroform if dropped into equal parts of strong sulphuric acid and water will rise to the top. Before doubting such a high authority as Mr. Fouleiran I have repeated this test frequently, and in various ways, as adding the chloroform to the sulphuric acid, also by reversing the experiment. I have added a large quantity of chloroform than sulphuric acid, but have invariably found the chloroform to remain above, or if poured in first, to make its way to the top. If it is dropped from a height, some of it may go through the sulphuric acid and rest at the bottom, but much the larger quantity remains on the top. Or looking to the specific gravity of the two substances we ought to expect the
the Chlorsyran to sink to the bottom,
as one equivalent of Sulphuric acid is 1840

Water 1000

2 8 4 0

Two equivalents of Chlorsyran 14 9 7

1 4 9 7

2 9 9 4

Sulphuric acid & Water 2 8 4 0

Excess of weight of Chlorsyran 15 7 4

The Chlorsyran indeed was quite pure,
prepared by Messrs. Duncan and Flückhart.
The test first proposed by M. Kemp, that
pure Chlorsyran when added to Sulphuric
acid gives a convex surface downwards
is an infallible one; any impurity present
causing the surface to be less convex;
and when very impure, it stands perfectly flat upon the Sulphuric acid.

The presence of considerable quantity of
alcohol in Chlorsyran causes an opalescence.
When in small quantity, it may be detected
by adding a solution of Bromate of Potash
and a few drops of Sulphuric acid, which give
the Chlorsyran a green colour. No change takes
place with pure Chlorsyran. Find what
I do not see mentioned in the description of the test) that on standing for four or five hours the colour, which was originally green, changes gradually to blue, and in pure chloroform, where no change was at first observed, if allowed to stand a day becomes green, similar to the impure when first joined. No further change takes place in either, although allowed to stand for upwards of a week.

Ether may be detected by placing in a tube a solution of Iodide of Potassium, to which is added two drops of nitric acid and a few drops of sulphuric acid; then pour in the suspected chloroform, if ether is present the whole mixture assumes a reddish cherry wine colour; but if the chloroform be pure it is changed to a violet colour, the rest of the fluid remaining clear.

The empyreumatic oils are detected by adding strong sulphuric acid, which causes them to leave home, giving a dark line between the sulphuric acid and chloroform. This test must only be used within
within certain limits, because no chlorine
however pure can stand the action of
sulphuric acid for a length of time, without
slight decomposition. We may consider it
pure if no alteration takes place a few hours
after adding the sulphuric acid.

An easier method and one quite as definite
has been proposed by F. Gregory, which con-
sists in storing a few choptes of chlorine
in a handkerchief, allowing them to evap-
orate, and ascertain whether there be any
unpleasant odour left; pure chlorine
leaves no smell, but the presence of any
unsuitable oil is detected by a dis-
agreeable odour being left after evaporation.

Chlorine and Hydrochloric acid are
liable to occur as products of decomposition.
They are known by the smell, and a dis-
agreeable feeling in the throat if inhaled;
chlorine in decomposed gives with a
solution of Potassium goitrogen a white precipitate.
The bleaching property of chlorine may
be seen by which it is distinguished from
Hydrochloric acid.
See Monthly Journal of Med. Science for May 1850
As to the circumstances which lead to the decomposition, we are still uncertain. It has been said that heat and light or both combined effect the change, but that amount of either or both, it will stand, is difficult to determine. Different modes of preparing, and purifying, vary as to keeping. A few years ago, when very undifferentiated prepared, G. Gregory seeing the necessity of having a certain test of its purity, proposed a method of filtering it through sulphuric acid, taking the imprue chloroform and shaking it with half its bulk of strong sulphuric acid. It was drawn off, and if not then quite pure mixed with a quarter of its bulk, and this process continued, until it ceased to be coloured by sulphuric acid. It was then shaken with powdered Peroxide of Manganese to separate any sulphurous acid. Messrs. June and Flockhart and Mr. Macpherson of this town both tried this new process on a large scale, but they found that the chloroform decomposed via...
few weeks, giving off a strong odour of chlorine. Dr. Christison made some experiments and came to the same result. That this decomposition is not a necessary consequence is proved by the fact, that the specimen of chloroform which Dr. Gregory exhibited at the Royal Society when he read a paper describing this new process, was perfectly pure many months after, although it was not prevented from exposure in any particular way. I have tried the purification according to Dr. Gregory's method, and have found that chloroform prepared as pure as Messrs. Duncan & Flockhart's, when treated by that process, decomposed in a few weeks, evolving chlorine, and gave a white precipitate with Nitrate of Silver. Through the kindness of Mr. Macfarlane, I obtained some chloroform after the first distillation, before being subjected to any purification. It had a density of 1.336 and left a very offensive odour when allowed to evaporate on the bench, having added 6 degrees half its bulk.
bulk of strong sulphuric acid, considerable
heat was evolved, and the chlozorn became
of a brown colour. It was drawn off in 24 hours
having been thoroughly mixed with the acid
three times, during the period exposed. As
a distinct discoloration still appeared with
sulphuric acid and a quarter of its volume more
was added, and after having remained
in contact also 24 hours, being likewise
three times well shaken together, it was
drawn off, and being now pure was mixed
with powdered Peroxide of Manganous to
remove any Sulphurous acid. After these
manipulations, the chlozorn has a per-
fectly sweet odour, left no disagreeable
smell after evaporation, specific gravity normal.
Being anxious to ascertain if possible,
whether any particular light had to do with
the decomposition, I stained bottles of red,
green, yellow, and blue, into which I placed some
of the purified chlozorn. To have a comparative
experiment, I placed some of Dunant and Hopp's
chlorzorn into bottles similarly coloured,
and exposed them all at the light in my
There
There were also a couple of common glass bottles, each containing a specimen of the two kinds of chalcopyrite placed along with the coloured bottles, and two other common bottles kept in a chest drawer to exclude them from the light. The specimens were exposed on the 26th Jan., and I examined them all on 27th Jan., but none of them presented any signs of decomposition. I tested them all by evaporation on a hard pewter slip, nitrate of silver; on applying the tongue to the wetted stopper it tasted quite sweet, whereas if any decomposition had taken place the acid taste could easily be detected; nor were there any drops adhering around the upper part of the bottle, a circumstance which I have invariably observed when decomposition to any considerable extent has taken place. I am quite aware that my experiments prove nothing, because they have not been sufficiently long persevered in, nor was the light strong, owing to the short days of winter, nor have they been exposed to heat. I mean to continue the
the investigations on during the summer when I shall have both stronger light and heat. I am inclined to think that Dr. Gregory's process, although it has failed, might be an exceedingly good mode of purifying chlorophyll, if the length of time to which it ought to be exposed to the action of the sulphuric acid was accurately determined. If we could rely on always obtaining chlorophyll as pure as that manufactured by Messrs. Dunlop, Flockhart and Mr. Macfarlane, nothing further would be required. But unhappy specimens are met with sometimes for you see, and if Dr. Gregory's method is not a good one for purifying them, it is certainly an admirable means of detecting impurities. Chlorophyll already rectified will not stand the action of sulphuric acid without decomposing; whether it is from the specific gravity being raised so high that it decomposes apart entirely, or from the contact of the sulphuric acid is a point I have yet settled. Too prolonged contact with
with Sulphuric acid, and appears to favour de-
composition! For part of the same chloragum
which was put into the coloured bottle, I ac-
cepted to a third rectification with acid, and it
decomposed in the course of three or four weeks.
The subject of the decomposition of chloragum
is one not easy to unravel, for those that
have had much experience, for example
Mr. Hunter, the Superintendent of Chelsea
Opium and Jacaibat, establishment,
tells me, he has had specimens in the shop
for months, that have kept respectably,
and in the course of a warm summer's
night they have been found decomposed
next morning. They have according rec-
commended very properly as seen on all
the labels placed upon the bottle, that it
should be kept cool, and not exposed to
bright light. I could be well of prudence
before using chloragum smell it first to ascertain
if it is quite pure. The chlorine is easily detected,
at least if present to that amount as to cause no
inconvenience to the patient. I have good reasons
to believe that many of the cases of nausea, sickness, and
headache, which have, and occasionally do arise, may
be in a great manner attributed to impure chloragum.
See Edin Monthly Journal of Med Science for 1848
Page 741
Other substances possessing anaesthetic properties.

Salicylic Ether, which was used for a year before the properties of chloroform were discovered. It is inferior to the latter because more is required to have the desired effect. Its action is not nearly so rapid, and much less persistent. The inhalation and influence is not nearly so agreeable. It is more expensive. The odour and the danger to the lungs persist for a considerable length of time, and when used in labour it affects the child, neither of which occur with chloroform. It is not nearly so portable. An apparatus is required to administer it with. Dr. Gross mentions further that he has found that it occupies more space in the lungs, and consequently prevents a sufficient amount of atmospheric air being present. It causes a greater flow of saliva.

Chloride of Hydrocarbons or Dutch Liquid, formerly called Chloric Ether. When inhaled is liable to cause a great irritation of the throat that few persons can preserve, but if they can, the usual phenomena present.
present themselves without excitement of the circulation, or subsequent headache. It produces an extreme degree of acid irritation of the throat, which does not disappear for hours afterwards. If there were no other objections to its use, the expense would be sufficient to prevent its introduction into practice.

Nitrous Oxide or Nitrous Ether, is pleasant to inhale, but during the long period which elapses before the state of complete anesthesia, the sensation of noise and fullness in the head are in general excessive; and much headache and giddiness have usually followed its employment, and persisted for sometime afterwards.

Benzoin or Bicarbonate of Hydrogen, like the former, Nitrous Ether causes excessive ringing in the head when inhaled.

Alcohol or Hydrated oxide of Acetylene, when breathed causes great coughing and dyspnoea, the constriction in the chest
is similar to a severe fit of paroxysmic asthma. In some of the cases Dr. Simpson tried it the results were as above; viz., with the insensibility was more complete, but during the time, the pulse became small and feeble, and on recovering consciousness the bronchial constriction returned; and annoyed the person for some time afterwards.

Bisulphuret of Carbon or Alcohol of Sulphur produces when breathed rapid anaesthesia, but it is followed afterwards by headache and giddiness. It cannot be used in Midwifery as it affects the powers of uterine contraction, so as often to suspend them. It has likewise a very offensive odour, like that of putrid College Hydrocyanic acid and if rubbed upon a part produces local anaesthesia. The danger of its coming to be absorbed, and thus act as a deadly poison, prevents its being used.

Carbonic acid gas acts as a local anaesthetic, and for this purpose it has been used.
in cases of Dysmenorrhœa, and has relieved the patient of her suffering. It was supposed that anaesthetics owed their property to the carbon the contain acting upon the blood, but that this is not the mode the act is proved by the fact, that they do not all contain carbon. For instance Nitrous oxide, which was previously mentioned as possessing anaesthetic virtues, contains no carbon. Viewing the effects of all these various substances it is easily seen that they are all inferior to chloroform; it being surpassed by none in any quality, whereas it surpasses them in many ways, as in cheapness, easy administration, unpleasant feelings exhibited, and rapid after effects.
Physiological Action.

Chloroform acts as a stimulant, sedative, antispasmodic, and anaesthetic, the last of which is the most important.

If a few drops be sprinkled on a handkerchief, and held over a person's face atmospheric air at the same time being freely admitted, the following effects take place. After a few inspirations the patient commences winking his eyes, rapidly, and the eyeballs are rolled about; the muscles next become stiff, especially those of the arms and legs. The head becomes raised from the pillow, and the neck is felt exceedingly stiff. The patient at this time very often tries to remove the handkerchief; or the head is pushed away as to avoid the pricking fumes; he often talks loudly, and attempts to rise from the table or chair and strikes with his hands and arms. If the patient is a strong muscular man, it may require four or five people to restrain him, and he kicks as no joking matter sometimes especially
especially if he has on a pair of shoes well studded with nails. As the inhalation is continued, the talking becomes less distinct, and the muscles become flaccid. The head lying on the pillow, the arms down by the sides, and the knees, instead of being bent upon the thighs, come to lie flat upon the table. When the muscles are completely relaxed, the eyelids motionless, and the eye-balls fixed upwards; the breathing stertorous; the face somewhat suffused; we know that anaesthesia is fully established. Although these perhaps may be considered the general occurrences in a healthy adult, we have all varieties, some being perfectly quiet; doubtless much depends upon the temperament of the person, their former mode of living, Poise going and talking around the patient isAvoided, as it causes them to move restless. With the Jarrer, it acts more rapidly, and not infrequently there is no sleep, the patient going into a perfectly calm sleep. Not unfrequently, when Chloroform was

just
Just used people failed to produce unconsciousness, because they got frightened when the patient became obstreperous, thinking that a fit was coming on. Practitioners are now aware of it being a natural consequence.

An account of these failures it was supposed that some people could not be brought under its influence, but we know that if given in sufficient quantity, and for a sufficient length of time, no person can resist its effect. The doses required vary some people taking much more than others, more especially seen in those who are intemperate, they both require more to put them asleep, and struggle more while it is taking effect. We see the same differences in doses with other things; for instance, some people can take much more alcoholic liquor than another without getting intoxicated. From what has been said regarding the different ways in which chloroform affects people, it is easy
easy to understand that by giving
echloroform by means of a handkerchief
piece of lint, or sponge, that none of it
must escape, consequently we cannot
say confidently the dose for each person.
This is the only objection which the
advocates for the use of instruments, can
bring up against the use of a handkerchief.
But surely it is of far more importance
to us to watch the symptoms of the patient
rather than noting every drop inhaled
into the lungs. It has been estimated
that a handkerchief an average will suffice
to put most people asleep; this
does not include what evaporates from the
handkerchief, but there are few operations
that can be performed with so small
quantity. As regards the manner
in which the different systems are affected.
We find generally the pulse rises at first
and then falls, when the tetanus breathing
commences, and continues to do so until
consciousness returns. In some cases the
pulse remains rapid throughout the state.
The pupils commonly dilated, other-
times contracted, and in some no change
takes place. There is usually hypopnoea
over the surface, in some cases its change
is observed. The respiration increases in
number generally during the effect. Some
patients complain of a choking sensation,
seeing things of one colour, and they some-
times have delightful sensation. In some cases
inconvenience being ringing in the ear,
and strong pulsation force felt in steth.
The cerebral functions are so suddenly
acted upon in some instances, as ap-
parently blunts every sensation, the
person neither feeling nor seeing any-
thing. The time it takes for a person to
be completely anaesthetised varies from
40 seconds to 2 minutes. The effects of
ether on the lower animals are the
same as in man, and they go through
the same restless stage before anaesthesia
is induced. If carried too far death
is produced and on examination the
heart is found on the right side distended
with
See Medical Gazette Jr 1851 Page 674

See American Journal of Med Science Jr 1853
with blood, the left side empty. It produces the same effect if injected into a vein taken into the stomach, or passed up the rectum. But a much larger quantity can be taken by the stomach before the effects are produced, and they take place much more slowly than when inhaled.

For example, a case is recorded by J. Taylor of Sheffield, where a person swallowed four ounces of chloroform. Although before all recollection of his movements, he still was capable of walking and exciting himself, at least an hour afterwards. It appeared to act more like alcohol than chloroform. Also if injected into the rectum a larger quantity is required. J. de Chamounet injected two draughts up the rectum of a rabbit, and no effect was a slight intoxicated appearance showed itself. A half of this quantity would have produced complete anaesthesia if inhaled by the lung. In man if given in this mode, it exceedingly apt from the irritation caused to produce diarrhoea. The cause of its affinity.
Lucy as much increased by inhaling is due to the immense exposure of surface to which it is exposed in the lungs, being quickly absorbed by the lesser circulation and then the blood after passing through the heart carries it to the brain. There is one way by which Chloroform if taken into the stomach acts with rapidity and in small quantity G. D. D. Dupree has found that by adding a few drops of Chloroform to a little of soda water an exceedingly intoxicating mixture is produced which if drunk will act as completely as champagne.

The manner in which the nervous system is acted upon is as follows.
1st. Loss of cerebral functions.
2nd. Loss of Spinal Junctions.
3rd. Loss of Junctions of Medulla Oblongata.

Flowers says the anaesthetic effect travel from the poles of the hemispheres to the cerebellum, then to the posterior half and roots of the nerves of sensation in the spinal cord, then to the anterior.
half and most of the nerves of motion, and lastly to the medulla oblongata, and
annular protuberance.
Its effects on the cardiac functions are
generally manifested by a degree of retraction
which gradually passes into coma. It may
sometimes be remarked that the organs of
special sense remain entire, while the
common sensibility is quite removed; this
is seen even more decidedly with chloroform.

As regards the manner in which death
occurs from an overdose of chloroform there
has been considerable difference among
various observers. Some maintaining that
it is gangliosia, others finding the
heart action to cease first. It is easy
to imagine that death may ensue in
various ways according to the concurrent
circumstances; but that the normal
way (if it may be so called) is to
think there is little doubt. It would
occupy too much space were I to give the
different experiments and theories of the
men
who have investigated this important subject. I may mention among the latest the ingenious and well-conducted experiments of Mr. Bicknell of Liverpool, who has clearly proved that it is by a sudden beginning at the heart that chloroform when alone acting causes death. I have revised his experiments as nearly as possible, and have obtained the same results.

Experiment 1. One full grown gentle rabbit, having pinned between the flakes of chloroform on a piece of linen, held it over the animal’s nose and mouth. Slowing made a few kicks became in little more than half a minute quite quiet; its ears hung back, and the pupils became very much dilated, the respiration became deeper and the heart’s action less rapid. The chloroform having almost all evaporated from the linen, the animal revived considerably. More chloroform being given the animal was again made unconscious, and this state kept up until
it died. Before death, the respiration became exceedingly deep, the abdominal muscles contracting violently. Immediately after the respiration had ceased, I opened up the chest and found the heart contracting regularly from 70 to 80 six minutes. The contractions became feeble and slower, ceasing altogether between 4 and 5 minutes after the thorax had been opened, the right auricle being the last to contract.

Experiment 2. Also pull from rabbit, chloroform being administered as in former experiment, the same preliminary result of restlessness took place. After anaesthesia was produced, opened into the abdomen just below the cuneiform cartilage, and placed my finger in contact with the diaphragm, felt it contracting strongly 60 to 80 six minutes, the heart was also distinctly felt through the diaphragm. The thoracic cavity was then opened by cutting away the front of the ribs and sternum, leaving the diaphragm entire. Noting the
the pericardium, the heart was seen contracting strongly 100 per minute. This went on for about a minute, when more chloroform was given to the animal, and the respiration all at once ceased; the heart's action continuing as before. In the course of 50 seconds two prolonged inspiration took place, and the heart's action became very much accelerated. No other inspiration took place, and the heart having contracted in this rapid manner for nearly three minutes, at length became much slower, and weaker, and finally stopped a minute after. These two experiments agree precisely with the two just mentioned by Dr. Bichastetta, and therefore demand the inference that chloroform when given to animals in such an extent as to cause death, does so in the way of coma; the medulla oblongata being affected, the respiration stops, the venous blood comes to be congested in the lungs and right side of the heart. The
* see Medical Gazette Jan 1868-49
The post mortem appearances seen in these two experiments, as well as in all those I have examined, have been the same, namely, the lungs highly congested; the right side of the heart gorged with venous and the left empty. Analogous in some respects to my first experiment, in some respects it is one recorded by Dr. Knox which I may here mention. He put a small rabbit into a jar containing the vapor of chloroform. The animal was quickly affected and ceased to breathe in less than a minute. It was taken out immediately the respiration had ceased and the heart's action could not be felt. The thorax was opened as quickly as possible, and when the heart was first observed, it was quite motionless, but it had not been exposed to the air more than a few minutes before it recommenced to beat, the auricles beginning first, and shortly afterwards the ventricles, and in three or four minutes the heart was contracting vigorously.
organically. Dr. Linnaeus explains this by supposing that the chilagone had evaporated from the heart, because he found on adding a drop directly to it, that the contractions ceased.

That the results which Dr. Linnaeus obtained from this experiment are what naturally might be looked for, is evident, but I cannot agree with the explanation he has given.

It is not doubt that the heart's action may have stopped; but how it recommencing again when the thorax was opened can be explained by evaporation of the chilagone from the heart, I cannot concede. In my first experiment when the thorax was opened immediately after the respiration had ceased, I can confidently assert, that the heart was contracting when the thorax was just opened, and did not commence some time afterwards. I am therefore disposed to explain the occurrence which happened in Mr. Dumas experiment thus:

That
That the animal probably had an overdose of chloroform, which caused failure both of the respiration and heart action, and that being renewed into atmospheric air, by the time the thorax was opened, the effects had gone off, and that the return of the heart action was a sign that the animation was attempted to be restored. I cannot see how it can be explained for the chloroform evaporating from the heart, it is not confined behind the sternum, or in the pericardium. The application of it directly to the heart, causing the contractions to cease, is only an example of local anaesthesia, which can be effected similarly in the limbs of the rabbit, causing the muscles to remain motionless. I have sometimes thought that exposure to cold might be the cause of the heart contracting after the respiration had ceased, and that this might stand as a argument against any experiments if it is the exposure to...
to the air that causes the contracting they are strong enough to propell the blood through the circulation, at least for a considerable distance, as I satisfied myself by the following experiment.

Exp. 3d. Administered Chloroform to a full grown rabbit, when fully anaesthetised opened thorax as in previous experiment. The respiration stopped two minutes after the operation, the heart's action continued rapid. Previous to opening the thorax, the general action was put to the test to ascertain how long the blood would be propelled through it. But although blood escaped from it, owing to the laxity of the heart, and also probably from my clumsy mode of operating, I could not obtain anything like a jet. After the respiration had stopped, my friend Mr. Cullen who kindly assisted me in nearly all my experiments, and to whom I am much indebted, proposed to cut through the diaphragm of the abdomen, which he accordingly did, leaving aside the intestines.
the abdominal aorta was felt distinctly pulsating. It was situated rather below the level of the kidneys. Blood was propelled from it in jet, corresponding with the contraction of the heart, and continued to do so as long as its activity continued, which was fully more than a minute. As the heart's action became weaker, the blood was propelled in a less distinct jet.

We cannot overlook the possibility of death taking place from asphyxia during the administration of Chloroform. And probably this mode of death is more common than any other as a result of its use. It has long been remarked that more deaths have taken place during small operations than the opposite. Let us suppose for example a person is being operated upon for hemorrhoids, or amputation of a finger or toe. Perhaps there are only two persons present, the operator and his assistant. The patient is put to sleep quite favorably.
Fortunately, and when the breathing becomes euticous, the operator commences. We will suppose it a gullet. After the gullet is amputated, the patient perhaps shows symptoms of returning consciousness, the assistant then makes for the chloroform bottle, pours some upon the handkerchief and applies it to the face of the patient; at that moment the operator requires him to tie a small artery, which is throwing out a jet of blood or to hand him a sponge, or any other instrument he may require; during this time the handkerchief has been left on the face of the patient, on removing it to the horror of both operator and assistant, the face is blind and the breathing stopped. Although this description is quite imaginary, I may say, never having, I am glad to say, witnessed anything of the kind, I still from the accounts I have read and from what I have heard, I am afraid it has happened more than once. If a case such
as I have attempted to describe, took place. We would not undeniably put it down as death caused from asphyxia, but the asphyxia was not caused by the chloroform, it was by the handkerchief closing up the air passages, as firmly as ever Burke and hare did, when they murdered their unfortunate victims. And what is then the handkerchief, but the heavy fumes of the chloroform plugging up the passage to the lungs. We might as well say that opium, or any other narcotic drug, caused death by asphyxia, for if a person be put sound asleep by chloroform and a handkerchief put over his mouth, it is needless to say, that he will soon die asphyxiated.

There is still another mode in which a person may die, while under the in- fluence of chloroform, namely, from syncope, but syncope, and even of a fatal character, is a misfortune liable to accompany operations without the use of chloroform. Whether syncope can be caused by its
* See Samuel J. F. Feb. 6th 1848
incautious use, is another matter.

1. I know divides anaesthesia into five stages.
2. That in which there is exhilaration, altered motions, and sensation of some kind, the patient being still conscious.
3. The mental functions may still be performed, but only in an irregular manner, there may be ideas of a dreaming kind, and voluntary efforts in accordance with them, or the patient may be passive.
4. The functions of the cerebral hemispheres appear to be totally suspended, but those of the spinal cord and its nerves still continue to some extent; the muscles may contract when touched, groans, or cries may occur, but no sounds of an articulate kind. Also sometimes in voluntary muscular contractions, as an effect of the vapour, apparently a kind of excitement of the spinal cord.

4. No movement is obvious, except that of respiration, which goes on regularly though often with anong or even some degree.
of centre, all the nervous centres seem to be paralyzed, except the medulla oblongata.

That stage in which the breathing is difficult, feeble, or otherwise impaired, before it finally ceases.

To prevent a person feeling pain, the anaesthesia must be carried to the 3rd or 4th stage.

Dr. Snow further says as an argument against giving chloroform too rapidly, that it is an accumulative poison, and if inhaled in large quantities at once, the person is brought rapidly into the fourth stage, and from its accumulative properties, may be carried beyond, into the fifth, and thus death ensue from the direct sedative action upon the heart.

This doctrine appears very well in theory, but whether it really exists, I think doubtful. I tried an experiment giving it in large quantities rapidly, and I expected to have met with a different result. Having obtained a full grown rabbit, I poured chloroform over its
to the amount of between 3 and 4 drachms, and applied it over the nose and mouth of the animal, taking care at the same time to allow free entrance of atmospheric air. Anaesthesia was almost instantly produced. The thorax was opened in the same manner as in previous experiments. The heart was seen pulsating violently, the respiration was also vigorous. Chloroform was continued to be given in large doses. In little more than half a minute after the thorax was opened the respiration suddenly ceased, the heart's action continuing 20 seconds longer when it also stopped. Thinking the animal was dead, the inhalation was given up, when in half a minute after the heart had ceased to beat, it recommenced slowly and vigourously. The heart, of an intermitting character, Blumen died into the lungs was tried to see if the respiration could be excited, but none ever took place, and after a few feeble contractions, the heart ceased to beat.
Post mortem appearances the same as in former experiments. Lungs congested. Heart, left side empty. Right gorged with blood. In this experiment there was very nearly an ounce of chloroform used, a large proportion of which the animal inhaled, as little being lost on the linen as possible. The experiment was repeated with another rabbit, and the result was essentially the same, failing progressive cessation of the heart action before the respiration. Although my experiments may justly be said to be too few, and perhaps open to allacide, which have escaped my observation, still I consider that in opposition to Dr. Snow Chloroform as perhaps of all poisons, the least liable to hurtful or overdoses, i.e., effect, long to transient, instead of accumulative. I understand that term a medicine which if introduced into the body may or may not show itself for considerable time after being introduced, but entire hols so for long after the reason has given up.
up taking it, for example Mercury
deads it. Contrary to this being the case
with Chloroform, its effects are exceedingly
longer after the body than
most medicines. Every medicine must
have a latent period of time between its
introduction into the body and its action
being produced; some are very rapid as
Strychnia, others slower as Quinine,
but all have a certain period, and
of course Chloroform must have also;
accordingly there must be a period between
the inhalation of the lungs and the action
on the brain; the effect on the brain being
kept up as long as the effects of the chloro-
lasm. If this is what Dr. Brown means as
I understand him, by the term accumula-
tive; it ought rather I think to be
called the latent period, as it cannot
come under the strict meaning of the
term accumulative. Contrary to the ad-
antage of commencing with small doses,
it is probable better to give at first
considerable quantity, adhering to two, or the
Same time allowing a free amount of atmospheric air, and by this means we prevent in a great manner the rotten stage taking place. Spirit is looking into Paré's Materi Medica, that the first caution to be observed in the administration of chloroform is, that it must not be given in large doses at once; because "Chloroform rapidly rivalleth in large proportion with atmospheric air, destroys life by paralysing the heart." This statement is probably derived from the experiments of F. Darry at least it agrees with his sentiments. It has been remarked by some experimenters on animals, that the heart ceased to beat previously to the respiration stopping; and in the human subject the same has been remarked. Perhaps in some of the cases so recorded, the persons may not have paid much heed to the remark, thinking it a matter of no moment. It requires a certain amount of observation, and if the person
has not paid particular attention at the time, in an after report, it might be put down without much consideration. This fallacy may apply even more so to the human subject. In a case where a yellow creature is on the brink of death, everybody present naturally secures themselves in the utmost to save him, and it can hardly be imagined that a person would really hold the hand on the heart, on the wrist, to ascertain whether the respiration, a circulation ceased first. Besides, the agitation and excitement caused by an occurrence of this kind, would very much stand in the way of anyone making an accurate observation. But I can understand it to take place under certain circumstances. Thus, giving a reason with extreme disease of the heart, either disease of the valves, or fatty degeneration had chloroform given him, it is just possible that the heart action might be so affected by agitation or otherwise as to below its action.
I have no doubt there are many persons whose hearts have been very much diseased have had Chloroform, without any bad result following; let us take for instance the cases of Clinical Surgery taught by Dr. Dyne in the Infirmary; out of the many hundreds who have been put to sleep during the time Chloroform has been used, I will venture to say that not a few out of the number have had disease of the heart and still not a single misfortune has ever happened. Many of the cases of death from Chloroform have been laid down by the coroner to disease of the heart from fatty degeneration, this is a very convenient term both for medical man and friends, but whether it is always the direct cause of death doubts perhaps in many cases may exist. Although it is no means follows that a person with extensive disease of the heart should suffer from the administration of chloroform, still if we are aware of it, I think our practitioners would be a little
a little caution, is giving it; our
propothesis, cannot on the whole be con-
didered to certain.
Another manner in which the heart's
action has been suspended previous to
the asphyxiation, is from severe shocks
causing syncope. We read in surgical
works of all ages, of deaths having occurred
on the operating table, and these deaths,
attributed to severe shocks upon the nervous
system. Mr. Bucknatt enthuses these
cases which came under his own observation.
One was a sickly emancipated boy at 16, re-
quiring amputation of the thigh, on account
of an exhausting disease of the tibia.
The moment the knife entered, the pul-
lation suddenly ceased, and was imper-
cceptible for the period of six or nine pulsations.
Another case was that of a young lady
about 18 or 20 years of age, whose thigh was
amputated by Mr. Eyre. The 
chill was administered by Dr. Simpson and
he mentioned after the operation, that
just as the knife was piercing the thigh
the
See Lanceet for July 29th 1848
the pulse stopped suddenly, and resumed itself with a flutter almost immediately. The third case was that of a woman of a pale emaciated appearance, and nervous constitutic temperature, who also underwent amputation of the thigh; the instant the operation was commenced, the pulse stopped and did not return for eight or ten seconds, when it was again felt as very faint and indistinct. The three cases mentioned by Mr. Birchall were fortunately all made good recoveries, but in one case a syncope resulting in this manner proved fatal.

* Mr. Robert was performing an amputation at the hip joint; when the anterior flap was being cut, the patient was breathing heavily at one time, the pulsation became all at once imperceptible, but the breathing occurred occasionally at intervals. The patient continued to breathe irregularly for a few minutes when he expired.
The cause of catalepsia occurring may
I think be explained in two ways.
Although no one can doubt that chloro-
form is a great safeguard in operating, as it
prevents the patient suffering pain,
and by so doing undoubtedly saves a
great amount of nervous shock, still
we cannot be justified in saying that it
removes it altogether, because we too
often see persons completely anaesthetised
by the abuse of ardent spirits. They will be
often seen to fall immeasurably without
feeling apparently the least hurt, but
if unfortunately they should fall with any
great violence upon their head, as to
cause concussion, catalepsia may intervene
even although the person is still unconscio-
The other mode in which the nervous
shocks may take place is one perhaps averse
if it ever did happen, namely if the patient
has not been sufficiently unconscious
before the operation was commenced.
Any person who has witnessed patients
during the administration of chloro-
form
must have noticed that if ever the cold steel be attempted to be used like
anesthetics is complete, the patient will
immediately show signs of disapproving
by being exceedingly restless, whether they
are conscious of it or not, is perhaps a doubt-
ful point. I recollect when I was doi
g to Mr. Lyme last Winter, a patient had
the actual cautery applied to the knee-
joint. As it is an operation not requiring
much time, the patient was not very
deeply chloroformed, whenever the cautery
iron was applied, he uttered a loud roar
and kicked violently. When it was over
and the cold cloth applied, he became
quite quiet, and was carried up stairs.
After he had regained consciousness,
I wished to ascertain if he had any
recollection of what had passed, and asked
him why he made such a noise, but he
was perfectly unconscious of even having
done so. Was he insensible of any thing
being done, when he roared out? I think
it highly probable he was, as he roared out
exactly.
exactly at the time, although he had forgotten it by the time he awoke. In this same manner I think it is quite possible to suppose, that if a person were not thoroughly under the influence of chloroform before commencing an operation, if they were of a highly nervous temperament, the shock might be sufficient to bring on syncope.

In the three cases of Mr. Wickenstedt, they were all healthy and emaciated, and suffering from existing disease, and probably their nervous systems highly excitable, therefore easily acted upon by any shock given. In the case recorded in the Lancet, where death followed the operation of amputation of the hip joint, although it is said that only the anterior flap was made, still taking into consideration the state of the patient and previous condition undergoing such a formidable operation, as well as the causes which could give rise to it, will explain perhaps for the occurrence of fatal syncope.

I cannot
I cannot go so far as Mr. Bickersteth in supposing that chloroform has no action upon the heart, as he says the heart continues its action uninfluenced by the chloroform for a period longer or shorter after the cessation of respiration; because as I have said at the beginning of the chapter chloroform acts as a sedative and if it acts as a sedative to the system generally, the heart must partake also we find the pulse in most instances rapid at first but falls when unconsciousness is produced, and remains slow as long as it continues. The falling of the pulse may in a manner be accounted for, if the fear at first produced being removed, but I am inclined to believe it is also owing to the sedative effect of the drug. But that under ordinary circumstances this sedative effect is not sufficient to cause death, previous to the stoppage of the respiration, I have proved by the few foregoing experiments. Having gone over although
* See Monthly Journal Med. Science Jan 1853
very imperfect, the mode in which death results as a consequence of the abuse of chloroform, and also death taking place during its administration but not directly from its use, I cannot leave the subject without referring to the unfortunate case of death from chloroform which happened to Dr. Gower at last summer, the mode of death in which case would seem to over throw the whole doctrine I have been attempting to uphold. It is certainly very difficult to account for the cause of death in this case. We cannot doubt the authority of Mr. Green and the other gentlemen who were assisting and declare that the pulsation ceased before the respiration. We have no evidence to suppose that it could have resulted from shock on the nervous system as the patient appears not to have been in a weakly state of health, nor could it have been from the operation, it not having been commenced. The heart was not found diseased. In short I am quite at a loss to
to account for this case; but nevertheless it does not in the least shake my belief as it is said seeing is believing. I did not see Dr. Jenner's experiment, but I have seen in all my experiments, the respiration to stop, quiet, and have failed to make the heart do so. I have no wish the slightest on the matter, if my experiments are faulty, I should take it as a great favour to be corrected, I only relate them as they were performed, and the results obtained.

Chloroform is seen to act as a stimulant in cases of excessive hemorrhage, where the pulse becomes exceedingly small. In these cases, inhaling it in small quantities, it has been several times remarked, that the pulse will become much stronger. As an antispasmodic it is used in several diseases as Rhusma, Cholera, Tetanus etc., these will be mentioned more in detail under the Remedies.
Uses in Surgery

First may be mentioned here, the manner it is to be administered.
The patient being laid on his back, with a pillow under his head, and
never if possible in the sitting posture.

On account of the danger of the patient fainting, all tight articles of dress must
be removed, especially from about the throat.

In women tight stays must be undoing
and also those must be extracted, a
flat piece of wood which females are
likely to have sewed into the stays
in the part situated in front of the
stomach. It is sometimes advisable
to administer the chloroform to the patient
in bed, especially in hospital practice
if they have been suffering long with the
disease, nervous system highly excited.
It also saves time. In private practice
it is generally more convenient to have the
patient in bed. These preliminary
arrangements having been made,
and two drachms of chloroform are poised

upon
upon a handkerchief, piece of flint, or a hollow sponge; whichever is at hand, and is held over the patient's face; taking care that it is not too close, to prevent free access of atmospheric air. In Edinburgh, where chloroform was first used as an anaesthetic, no instrument has ever been employed, a handkerchief or piece of flint serving the purpose. But in London, and many parts of England, it is not thought safe to administer it without an instrument, and with this view many kinds have been invented, some of them neat, others exceedingly clumsy.

The objections to their use are:

1st. In using any instrument it is absolutely necessary we must know the mechanism and manner in which it works, involving a certain amount of training liable to be forgotten.

2nd. Instruments however perfect are always liable to be going out of repair, also to be broken, especially if made of glass.
glass as many of them are.

3. It obliges a person to carry about an extra amount of instruments, which is always a disadvantage, and especially to a country practitioner, requiring to ride great distances, or a physician practising in town and not able or willing to keep a carriage.

4. More or less, it is not possible to apply it so readily when the patient becomes at all restless, with the handkerchief it can be twisted into any shape and applied to the patient's face.

5. The application of an instrument to the mouth of various people indiscriminately, may in many cases be anything but cleanly, especially in country practice.

6. An instrument no matter what shape or form always impresses patients with a certain amount of dread, especially seen in young children.

The only objection which the advocates in the use of inhalers can bring against the use of the handkerchief, which is of any
any weight at all, is that if instruments we save the amount of chloroform, this certainly is true, but on the other hand if we are to pay for instruments, keep them in order, and replace them when broken perhaps the whole part that is gained in chloroform is lost in instruments. Passing from this digression regarding the advantage of a handkerchief as an instrument, the results which happen to the patient are the same; the different stages of excitement are gone through which those endeavored to describe under the head of the Physiological effects. The less noise there is around the patient, the less will be the excitement; difference, occurs according to the patient's previous mode of suffering, if given to the free use of alcoholic liquors he will require more chloroform and will also be more restless, than one who has lived more temperately. It has been remarked that children require less chloroform to anaesthetise them in inspiration than grown up people.
*See Monthly Journal Med. Science Septem., 1863
As soon as the patient begins to breathe irritatedly, the handkerchief must be removed from the face, because if we continue doing so, the patient will fall into a permanent coma, and when more chloroform is poured upon the handkerchief, it should not be applied close over the mouth, in fear of impeding respiration. During the performance of an operation, the giving of the chloroform should be entrusted to an assistant, whose business should be solely to watch the state of the patient's breathing and pulse; he ought to take no part in the operation. *Except this, Mr. Bicknells gives it as his opinion that keeping the hand on the pulse, so as to watch its changes, is of little consequence, and may be considered of secondary importance. I think most men will differ from him in this respect, and perhaps he has said it a little too hastily, although he advises it to other people, he gives his own impression does not precede it.
it himself. In the cases where he found the heart to fail during the first induction of the knife, how could he have known this, unless his finger had been on the pulse. And in another part of his paper, talking of the rarity of the failure of the heart's action, he says "Although I have noticed the pulse at the moment of the first incision in almost every capital operation performed in the Infirmary, and many elsewhere since this period, I have never again detected the slightest variation in its character, at this particular moment. That the respiration is the most necessary thing to watch cannot be doubted, but I ought not to neglect the pulsation, it is quite easy for one person if he does not take part in the operation to watch both. If unfortunately the respiration should stop, what are the best means of restoring it? Undoubtedly the free admission of atmospheric air. How is this to be done? Before any artificial
means of inflating the lungs is bad because, there is one very simple little process to perform, the neglect of which and doubtless has often prevented any good results accruing from artificial respiration. I mean by this little expedient, pulling forward the tongue. Anyone who has attended Mr. Symes' Clinical Lectures, must have heard him mention this as the just and perhaps most important thing to be attended to. I have seen on some occasions than one, the respiration suddenly cease, and on forcing open the mouth, the tongue is observed folded back, and closing up the glottis. On catching it with a pair of forceps and drawing it forward, respiration commences. The tongue is drawn back from the relaxation of the muscle, owing to the nervous stimuli being withdrawn, it shuts up the passage to the lungs as effectually as if a plug were forced into it. If the breathing feels
* See Lancet Feb 9th 1860

† See Comptes Rendus Vol II Jan 1867
does not commence after the tongue has been pulled forward, we must have recourse to further expedients, plenty of fresh air allowed to play upon the patient's face, cold water may be dashed upon the face and chest; the ribs depressed, so as to imitate respiration; the lungs may be inflated by means of bellows, and this latter practice must be persevered on assiduously for some time; instance, having been receded where the breathing has returned, after continuing the artificial respiration several minutes.

Dr. Bichard proposes another mode of artificial respiration, namely, the operator to apply his mouth directly to that of the patient's, and breathe forcibly. He says he found it successful in two cases of suspended animation.

Galvanism has been proposed as a means of resuscitation, and very possibly, securing the action of the diaphragm, it might, if had recourse to in time, leg.
benefit. It is open to the objection that we cannot have a galvanic battery always beside us, and hence it is got into working order gradually the time to prove its usefulness has passed.

It has been suggested to use oxygen gas as a means of resuscitation, but this is certainly out of the question. The advocates of its use have said it is easily manufactured from chlorate of potash, this is very true, but that would oblige us to carry about a quantity of chlorate of potash, and that would be the least of the burden; we should also require a retort, jars, trough, lamp, etc., and besides, if we had them, the time it would take to manufacture would be long past any hope of renewing life. When people make proposals of various kinds for saving patients, they should always consider whether it is practically in private practice, because if it is not the thing is next to useless. How is it possible that either galvanism or oxygen
oxygen gas, could ever be made of service in private practice, and even in hospital practice these occurrences are fortunately so rare, that no one would think better of having a galvanic battery, or jars of oxygen gas as constant attendants upon the chloroform bottle, and granting that oxygen gas was present, I cannot see what advantage it could have over atmospheric air. The practice of giving wine, brandy, and other stimulants by the mouth which has too frequently been done is certainly contraindicated. When a person is deeply anaesthetised, they have lost completely the power of expectorating, any substance that they have gained access into the windpipe; well supposing we pour any fluid into the mouth the epiglottis being open and the tongue forward, it is as likely to enter the trachea as elsewhere, and consequently if it did, would most certainly cause the patient's death instead of bringing him to life.
Gnash of the glottis is said to take place sometimes, causing asphyxia. In those cases it is proposed to thrust the finger into the mouth and hooks up the epiglottis, having artificial respiration kept up by pressure upon the thorax, and if no wound is bleeding, open the jugular vein. It would appear in these last cases that traction might be of service, if we can be certain of our diagnosis; this operation is liable to some of the same objections, as the administration of stimulants; the fear that if there was much bleeding some blood might pass into the bronchi and thus embarrass the respiration. It is possible that by forcibly pulling forward the tongue we may be enabled likewise to pull up the epiglottis, and if this means do away with the severer operation, having gone over as far as I am aware the various means proposed for resuscitation, I may mention the methods Dr. Simpson recommends.
* See Laneet Jr. Sept 10th 1863
First the tongue should be pulled out, allow free current of fresh air upon the face; press upon the throat, she says she never tries any further expedient required, but if so, use artificial respiration, and cold water may be applied to the patient's face and chest. Should supposition where we are suspicious of the heart being at fault, stimulants, as ammonia or salt, which most people have in their houses, might be applied to the nose with benefit. Although we may have some hope of keeping up artificial respiration till the effect of the chloroform have passed off, it is doubtful after the circulation has come to be stopped whether we can restore animation by any means. Have observed however a case of resuscitation where the respiration and heart's action are said to have ceased, and artificial respiration with depression of the ribs had the effect of restoring the patient. The only inconvenience experienced from the use of chloroform is occasionally...
Nausea and vomiting. These occurrences were at just much more common than having nausea, but the chloroform was long kept
up. The vomiting might be serious, occurring during unconsciousness from getting into the trachea, but it almost
always occurs when the patient is just coming out of the sleep, and all that is required is to turn the head to one side to
allow free escape of vomited matter.
This complication may be much prevented if the patient is well taken care of and some hours previously, extreme grief is
no obstacle to the use of chloroform; it has been repeatedly given to persons for advanced age in life, and also to children
only a few days after birth; in both cases, with the best results. Certain diseased states of the system were thought to
contradict its use, as disease of the heart, lungs, and brain. The only diseases that there is now doubt in
giving it, is in diseases of the heart and epilepsy, although there may perhaps be
be risk in giving it when these diseases arise, as still it has been given many times, in both disease, without any bad consequences following.

I may now mention some of the most important uses of Chloroform in Surgery. In dislocations it is of the greatest service, as it enables us to come to a more certain diagnosis, and the joint is so much more easily replaced, owing to the want of muscular assistance being completely taken away, which a patient when conscious always involuntarily makes. Fractures, we are able to handle much more freely, and to come to a correct diagnosis whether it be fracture, dislocation, or both. In hernias generally we derive very great benefit from the use of Chloroform, many of them being able to be reduced with great ease, and thus preventing the necessity of an operation. It does not set as some suppose by removing the spasmodic contraction at the root of the hernia, because we see in cases of Femoral hernia where
may be
where Giulemi's ligament to the seat of structure, there is no contraction removed, and still the hernia may in most cases be easily reduced; it is rather by removing the general muscular contraction and thus rendering the parts loose. In tying arteriæ mammae it is of the greatest service. The surgeon being aware the patient is suffering no pain, is thus enabled to operate leisurely cutting down upon the attery and dissecting it, as one would do on the dead body. Of course it does not follow that the slowness of the operation ensures its being better performed; but it is reasonable to suppose, that an operation ought to be better performed when the patient is lying quite quiet, than when he is crying and crying out with every stroke of the knife.

Lithotomy is another operation much facilitated by the use of Chloroform, as it is of great importance the patient should be perfectly still, the being many part,
See Medical Gazette Jan 1851
very liable to injury, besides incisions about the prepuce are exceedingly painful.

Operations on the eye are rendered easier under the use of chloroform, long operation of is great delicacy we can easily understand, slight motion or restlessness of the patient, very embarrassing to the surgeon. It is generally thought, that the operation for Catarrh should not be performed while the patient is anaesthetised, owing to the danger of vomiting occurring afterwards. However, it has been recommended and practised by Mr. White, ophthalmic surgeon to St. Mary's Hospital. He advocates it as causing a quiescent state of the muscles, absence of angina, and mental tranquility.

In the extraction of teeth, chloroform is much used. It is an operation although not usually long in its performance, is one tolerably painful at the time. The patient's mouth ought to be kept
kept open by the introduction, previous to the inhalation of chloroform, of an instrument to prevent the jaws closing upon one another, which they are exceedingly liable to do, and sometimes not easily separated. Dr. Inglis of this town has invented one. It is made of wood and varies according to the size of the patient's mouth. This is placed between the upper and lower bicuspids, but if the teeth the contracted are on the side of the mouth, it may be put between the incisors. For further particulars regarding it see description in the Lancet for Dec. 18th 1869. Dr. Simpson showed his class the other day an instrument for the purpose of keeping the mouth open. I am sorry I cannot draw, otherwise I might give a representation of the instrument, without which it would be very difficult to describe it.

It would be endless to narrate all the different operations in which chloroform is found of benefit, it may be sufficient to
<table>
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<th>Name of Reporter</th>
<th>No. of cases</th>
<th>No. of deaths</th>
<th>Percent deaths</th>
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<td>127</td>
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<td>British Simpson</td>
<td>284</td>
<td>107</td>
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<tr>
<td>Upon patients Anæsthesiased</td>
<td>140</td>
<td>37</td>
<td>26 in 100</td>
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state that its use must give to the operator much more ease and comfort and saves the patient an immense amount of bodily suffering. As persons are bled as much pain it is reasonable to expect that operations may be undertaken now-a-days with a better prognosis, the shock sustained by the system being less. This is seen to be the case for Mr. Simpson has proved by statistics that out of a number of amputations of the thigh, the mortality is less when chloroform is used, than when it is not. The only successful case of hip joint which has happened in Scotland was performed by Mr. Lyon the patient being under the influence of chloroform. But many weeks ago we had an admirable instance of the advantage of chloroform in lessening the shock of an operation in an accident which occurred on the railway, the patient was brought to the hospital, and the nature of the injury was so severe as to oblige Mr. Mackenzie to perform amputation of both hips and shoulders.
joint, an amount of shock, which it is reasonable to suppose had the patient undergone it before the days of chloroform, he must probably have expired on the operating table. This patient as might naturally be expected did not unfortunately survive the operation long, it having been performed between 9 and 10 in the morning, and death took place at 7 the same evening. But during the whole day the patient expressed himself to be quite uncomfortable. I might relate many cases of protracted disease in which the shock of the operation has been rendered comparatively slight, giving the patient a much better chance of recovery; but I think the two I have mentioned show it quite clearly.

There are a few operations where chloroform should not be employed. Lithotomy is one, some have denied this, and in fact rather advocated its use, but Mr. Gilmore whose testimony at all points connected with surgery...
stands superior to any other, but it is not clearly upon good grounds. The safety of the operation may be said to depend upon the patient being conscious; it is not necessary that he should suffer pain, as this is no argument in favour of pain being necessary in surgery; his being conscious is the only guide the surgeon has to ascertain whether the instrument has grasped the stone or the mucous coat of the bladder.

This is almost the only operation I am aware of, where we require to attend to the feelings of the patient. In information regarding the tissue that is being seized, but when we consider that the operator is working entirely by the out of all sight or feeling with his fingers, it cannot be concluded that accidents should happen even although the greatest caution is practised. Passing the catheter, more especially if stricture exists, is better done without the patient being anaesthetised, owing to the fear of making a false passage; but in cases of spasmodic stricture,
is undoubtedly caused a great amount of pain being previously rendered insensible. It has been often observed that hemorrhage is less conspicuous when the person is under the influence of chloroform, this owing probably to the muscular contractions being renewed the vessels are cut so strongly pressed upon, also insensibility removes all fear which when present tends to cause an increased flow of blood. The venous flow has been seen to alter as follows:

When a small quantity of chloroform is given, the excitement which is caused increases the venous hemorrhage; a large quantity causing terrors, keep the patient remaining quiet quiet, the venous hemorrhage, but when given to that extent as to cause embarrassment of the respiration, the venous flow is again increased. A diminished hemorrhage is of course of great advantage; there is just one danger, that when the excitement and contractions of the muscles
muscles return, there may be danger of secondary hemorrhage; but by care in securing the arteries during the operation and not bringing the flaps together in adhesion two or three afterwards, it will provide against this danger.

To relieve pain during the healing of wounds chloroform has been found to be of service; the patient may inhale it or the local application will sometimes suffice.
Anesthesia in Natural labours.

Results

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<th>Patient</th>
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<th>Father</th>
<th>Child</th>
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<td>289</td>
<td>471</td>
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<td>and Correspondent</td>
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<td>J. Simpson &amp; Correspondent</td>
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<td>1289</td>
<td>732</td>
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*From Dr. Simpson's Lectures*
Abstetrical Uses

In natural labours, chloroform has the advantage of relieving the woman of the excessive suffering; it lessens the length of the labour by enabling the passages to dilate faster, the action of the uterus is strengthened, for by the experiments of P. Marshall Hall on if the cerebral junctions be suspended the reflex action becomes stronger, the uterus being controlled by the reflex system of nerves, must therefore act more vigorously. The diagnosis, whether natural birth and the part presenting, can be more accurately made out when chloroform is used. Statistics prove the mortality to be lessened, this is explained by the duration of the labour being shortened and accordingly the shorter the labour, the more favourable the prognosis.

The following are the rules F. Simpson has laid down in its administration in natural lab.

1. Begin it when the patient commences to complain of much pain, generally
towards the end of the first stage.
2. Generally inculcate perfect quietness around the patient, particularly when just giving chloroform.
3. Give it during the pain and always withdraw it during the intervals.
Not attending to this simple rule may and has been the cause, why some have found the uterine action to be impaired. There are exceptions to it, as when the pains are very severe, and the intervals between them long, we may give it between the pains.
4. When given during the first stage the anaesthesia need not be deep, except the suffering respect, or the symptoms of anaesthetic disagreeable.
5. As the second stage progresses make the anaesthesia complete, as to destroy all sensibility.
6. Do not allow the urinary bladder to become distended.
7. Do not restrain the patient during pain.
8. Be sure to remove the chloroform as soon
issue as the child is born.

9. Do not awake the patient artificially. When it is required to use the forceps or any other instruments to deliver the woman with, it is necessary the intra-uterine influence. In turning the child, the patient should be fully anaesthetized to control uterine action, and thus enable turning to be easier performed, and the risks of rupture of uterine greatly lessened. We are enabled to extract the placenta artificially if required, much more easily when the patient is anaesthetized.

Dr. Simpson mentions in his lectures a case where the placenta was retained, owing to an hour glass contraction of the uterus, after the puerper was chloroformed the muscular fibers became relaxed, and thus allowed it to be expelled.

In cases of deformed pelvis, where the head of the child cannot pass through, and after the long forceps have failed
to extract the child, by having the patient fully under the influence of chloroform, turning may be effected, and the body of the child brought through first, the lines of the skull may be made to compress, and the infant extracted thereby thrusting away with the barbarous operation of craniotomy, which is only the alternative after the long forces have failed to move the head.

No bad consequences are even seen to result to the mother from the use of chloroform; it may be used in many hours continuance. Dr. Simpson used it in one case for 14 hours. Although it was odour, it might favour haemorrhage, it is found to occur less frequently. Chloroform has no effect on the child suffering in this respect from ether. The average amount used in natural labours is an ounce an hour. It is a common observation that women delivered under chloroform make better recoveries, suffering less from after pains and regaining their spirits, than
than people delivered without Chloragon. Mania and
convulsions are less frequently seen if the woman has been anesthetized
during her delivery, when the practice which has been most
successful is the inhalation of Chloragon.
And in America they have gone so far as in many cases to do away with blood,
letting trusting entirely to the Chloragon.
It has been used with advantage in stopping spurious labour pains, and
thus in those cases preventing the risks gastric.
In dysmenorrhoea Chloragon has been
inhaled for many days together, but
on account of the frequent attacks which
is liable to be caused by the repeated in-
halations, Dr. Simpson recommends the
local application of it in this disease.
Hysteria and convulsions occurring after
delivery have in many cases been completely
controlled by the inhalation of Chloragon.
Also convulsions occurring in children
a few days after birth, and in

disease when its use has been
more continuously preserved in Dr. mixer gave a child six weeks old a hundred
ounces of chloroform in fourteen days,
with the result at last of overcoming the
disease. The child instead of falling
away in flesh seemed actually to fatten
upon this novel article of diet.
Having now gone over its principle
uses in natural and Instrumental
labors with the complications arising
from them, I will next treat its employ-
ment in Medicine.
Medical Uses

It may be used in the form of inhalation or taken into the stomach, as in some cases applied locally.

In spasmodic asthma, the inhalation is followed by marked benefit, in this disease chloroform possesses marked advantage over sulphuric ether. J. A. Wilson, in a case of bronchitis and asthma mentions a case in his lectures where he used it of great service, the gentleman declared that the expectoration was rendered more free than by any other anodyne he had tried, being in this respect preferable to opium which has a marked tendency to check expectoration.

In the treatment of cholera it has been frequently tried, and from the statement of various medical men it would appear in many cases to have succeeded, especially when used early in the disease, but others again have totally failed. It was tried in the hospital here with but was found ineffectual. During the late slight epidemic here, I witnessed a case...
a case in which Dr. Warburton Begbie administered it, the spasms were stopped for the time, but its effects were not by any means lasting.

In lumbago, neuralgia, and nervous diseases generally, the local application of chloroform in many cases affords complete relief. It is applied by saturating a piece of lint, placing it upon the painful part, and covering it with oil of olibanum to prevent evaporation. Orchitis has been treated successfully in this manner.

In the examination of Abdominal tumours we obtain great assistance by having the person anaesthetised, as by doing the muscles are completely relaxed, and we can pass our hand freely into the abdomen without any resistance, or giving the patient any pain.

Experiments made upon animals show it to be of service in combating against an overdose of strychnia. For if two animals get the same quantity of strychnia and one be treated by chloroform, and the
See Lavenet in July 22nd 1848
other left to nature, the wound will have much the better chance of recovery.

Hydropaedia has been treated by chlorine and a successful case is recorded where it was used by Dr. Ackersley of Liverpool. The sedative effect of cannabis Indica was tried but failed. By giving the chlorosmone the patient fell asleep in three minutes, and slept quietly for three quarters of an hour, and on waking was very much calmer and desultion could be performed, as to swallowing formulas. The inhalation was persevered with several times a day for five days running and under this treatment along with tonics, stimulants, and purgatives, the patient made a good recovery. It has been doubted some whether this was a true case of hydropaedia, but it would appear from the man’s statement, that he had been bitten by a rat apparently rabid, although it was ten years previously. The symptoms certainly simulated those mentioned by other observers. It would be undoubtedly
undoubtedly a very great benefit, if by any means so simple as the inhalation of chloroform we could overcome such a formidable disease.

It seems a disease closely allied in its symptoms to hydrophobia has according to the observation of many practitioners benefited, and been cured by the inhalation of chloroform. It has succeeded in arresting the violent muscular contraction, after large doses of opium and other sedatives and narcotics have completely failed. The patient may be kept asleep a considerable time, but even after waking, the good effects are still manifested if the fever not returning for some time, and in this way allowing the patient to take nourishment. Unlike other medicines that have been tried for tetanus, has in many instances failed, but it is acknowledged by all medical men, that there are cases especially the acute form of the disease, where no remedy have the least effect.
In Delirium Tremens it has often succeeded in quieting the patient, when large
doses of opium have failed. For the treat-
ment of the Insane, and more especially
for the conveyance of them from their places
of residence to the Asylum it has been used.
Dr. Irae Physician to the Morningside
Institution Asylum has tried it, but without
any good results in Insanity, but with
benefit in Delirium Tremens. He does not
advise that people should be carried
asleep from their own homes to the Asylum,
because in the treatment of the Insane,
it is of great importance, that nothing
should appear to the patient to be carried
on an unhandy manner.
Instead of the external application of
chloroform to the abdomen has been found
of service in remanding the spasms. A solution
to two grains upon a cloth and kept
applied to the abdomen from a quarter to
half an hour usually is sufficient.
Painful affections of the stomach, either
depending upon gastrocolic or organic diffi-
are often benefited by the internal administration of chloroform.

When chloroform was first introduced, it was thought dangerous to use it in pneumonia, but experience has proved this not to be correct, and in the contrary some medical men on the Continent have treated pneumonia by the inhalation of chloroform and apparently with good results as any other mode of practice, even granting that the statistics were faulty owing to selected cases being chosen for experiment. Dr. Barrengaff in Frankfort has published the result of his experiments as the following. The patient was admitted generally of the fourth day of the disease, and the treatment commenced the following morning. The average number of inhalations required were 74, length of time average 10 1/2 days. About 60 drops flowed upon a handkerchief, and the vapour allowed to enter the lungs between ten and fifteen minutes. If coughing was excited or unconsciousness produced, the chloroform was removed. This
This was repeated every three or four hours. In the majority of cases breathing was produced. The pain in the chest diminished, and in many cases a general improvement was observable even after the first inhalation.

I might mention many other diseases where it has been found of use, but I think the few examples which have been given, will prove its service as an antispasmodic and sedative of the nervous system, and that as such, it may be employed for a greater many disorders.
* See Samuel for July 29, 1868
Local Anaesthesia

Soon after the effects of the inhalation of chloroform had been discovered, Dr. Humphry of Leeds, as also Dr. Simpson, tried its local application. The latter observed that it was quite possible to anesthetize small reptiles, and other small animals, in part. The manner in which the experiments were performed was this: A small quantity of chloroform was put into a tumbler, the mouth being covered by a fold of paper. An aperture was then cut in the paper, and the part of the animal to be anesthetized was put through the hole, and exposed to the influence of the vapour. The portion exposed to the fumes was generally thrown into violent movements for a minute or two, before the state of anaesthesia supervened. Dr. Simpson succeeded in this manner to anesthetize the limb of a rabbit. He tried numerous experiments of the local application to man. It was found that the hand might be kept exposed to the vapour
vapour of chloroform at the ordinary temperature may length of time without any effect being produced. But if the temperature was raised to 150° or upwards, the vapor of chloroform became much denser, and by holding the hand exposed to the vapour, having a touch at its mouth, so as to prevent the escape of the vapour, a numb feeling was produced in the hand, like the sensation of partial paralysis: then a glowing or burning feeling, perceived in the part most exposed and gradually it extinguished a sensation of thrilling or prickling, which deepened and more. The hand at length became stiff and clumsy, and as if enlarged, and painful impressions felt somewhat less distinctly. But the anaesthesia was never to complete as to prevent the person feeling a shock of galvanism, or a sharp pinch, pricks etc. The skin became red. It was sometime after its removal that the hand regained its former cessation. The senses of motion and cessation are apparently equally
See Medical Times & Gazette, March 4, 1854.
Equally effective. Salicylic ether has a
like effect when locally applied, but not
nearly so decided. Anything that tends
to soften or lessen the cuticle, as might
naturally be expected, renders the ap-
lication more complete, as soaking it in
warm water. Ladies' hands from the
cuticle being thinner are more susceptible
than gentlemen's. Plunging the hand into
liquid chloroform produces a deeper effect
than the vapour. This local mode
of application has been found serviceable
in some diseases, as neuralgia; puerperal
pyrexia, etc.

A few weeks ago the question of local
anaesthesia excited considerable interest
in Paris, owing to the publication in the
Journals of a case where anaesthesia had
been performed free of pain, after the local
application of chloroform. The experiment
was made by Dr. Belati at the Clinique
upon a girl suffering from an abscess in the
crilla. The instrument used was composed
of a cartridge reservoir of air, adapted to a
upper pump, made to receive the sponge in the chloagum. A valve at one extremity permitted the air to enter the instrument, which terminated in a caoutchouc tube. The first application rendered the part insensible for three hours. In the second essay M. Dubois plunged a knife into the abscess, which was ripe. The patient declared she felt no pain and was only conscious of touching the part with her hand. From this time she suffered no pain.

Dr. Simpson and Dr. Lyne tried the same experiment, upon a patient in the Infirmary a few days after the publication of this case, but they came to very different results, as the patient felt the pain in opening the abscess just as acutely as if nothing had been done for her relief. Therefore we are led to infer, that some mistake must have arisen, how it arose, and who is to blame, remains to be proved. Also the numerous and careful experiments which Dr. Simpson made some years ago on local anaesthesia clearly proved that...
although it is possible to remove sensibility in the lower animals, yet in man it could not be effected to that extent, as to make it of any service in performing operations, especially on the deeper tissues, no matter how long the part was exposed. It can only be use where the pain is superficial and can be directly applied as in Neuralgia, Toothache etc.
Effects of Chloroform on the Blood

This subject attracted a good deal of attention at one time in Paris, there being one set of observers holding that the arterial blood became darker, another set maintaining that the venous blood became if anything brighter than the arterial, and that the latter was unchanged. M. Guiby was the principal experimenter who held that the arterial blood did not become darker.

The mode in which his experiments were performed was as follows.

He exposed the arter and vein of the animal (dog) in the leg, and watched the colour coming from both vessels; he then drew a small quantity of blood from the arter and vein, and put them upon separate plates. He then placed a ligature upon the vessels. He next laid bare the arter and vein on another limb, and then giving the chloroform, watched the blood in the veins, degrees change to bright red.
he took blood both from the artery and vein, collected it in separate dishes, and tied up the vessels. In a short time after the animal had regained consciousness, he opened the jugular vein of one side of the head, and took some blood, then opened the carotid on the other side and comparing all the three kinds of blood, he came to the following conclusion.

That the arterial blood was redder, at least as red, when chloroform was breathed, as when not.

Venous blood became of a clean red colour under chloroform, losing its usual reddish black tints.

Venous blood in an animal under the influence of chloroform is redder than with chloroformized arterial blood, and nearly as scarlet as such blood, when saturated by chloroform.

The temperature of the animal is lowered when submitted either to the influence of ether or chloroform, more especially
*Les comptes rendus Vol. II Jan. 1847*
especially the Gamer, and the same occurs whatever way it is introduced into the system. They differ in this respect from other Narcotics, which raise the temperature.

The principal experimentalist on the other side was Mr. Annibassat. The mode in which his experiments were conducted was as follows.

Having laid bare the nerve, artery, and vein, in the leg of a large dog, he then ad. ministered Chloroform, and found gradually the blood in the artery assuming the same deep colour as that in the vein.

He then cut the artery across, and allowed the dark blood to flow out, and when the inspiration of Chloroform was suspended, the blood returned to its normal colour, and afterwards on occasioning the artery the two different obtained clots of blood could be seen in the vessel. He says the appearance is very transient.

Dr. De Chaumont read a paper to the Royal
Royal Medical Society were content, containing some experiments be made upon the subject. He found that agitating Chlorophyrm with blood prevents its coagulation, and that if venous blood the colour is rendered lighter or as bright as the arterial. That although the colour of venous blood was made brighter out of the body, still as long as Chlorophyrn was not given so as to embarrass the respiration giving a tendency to asphyxia, the colour of neither the venous or arterial blood was changed within the body. Iam long. I have not been able to confirm any of these experiments, not having succeeded in getting a dog, which is perhaps as small an animal as the experiment can well be tried upon. Attempted it once or twice on rabbit, but failed, owing to the opacity of the skin over the vessels, the blood never flowed in a stream, but always got beneath the skin. Viewing the whole
* Journal de Chimie Médicale en Mars 1849
of the three chief experiments, it will be seen that Dr. Grubly and Dr. Amussat came to very different conclusions, and that Dr. de Chauixmont takes an intermediate course. I am inclined to adopt this course also, for although Dr. Grubly's experiments appear to have been performed with great care, still I am not aware that surgeons, who have ample opportunities of witnessing changes of the blood during operating, have found the venous blood to become brighter in colour than the arterial. The cause of Dr. Amussat finding the arterial blood dark as the venous, was most probably owing to asphyxia. *Chloroform may be detected in the blood by placing the suspected blood in a flask to which is attached a tube. Heated in the centre, the tube is dipped at its extremity with a paste made of iodide of potassium and starch, & is often end being covered with paper moistened by the same mixture. If chloroform be present
See Lancet 1849 Vol II.
the paper will be tinged blue. The principle
of this experiment is, that the chloroformy
leat is decomposed, chlorine and hydro-
chloric acid are formed, which act upon the
Iodide of Potassium, setting free the Iodine.

Sir Brewster modified this process by
using Nitrate of Silver, instead of Iodide
of Potassium, and starch. By either
means a very small quantity of Chloropon
may be detected. It has been observed
that in persons who have died under
the influence of Chloroform, the body took
on the sign mites very quickly, and it is
said that the blood has remained
much more fluid than usual. Although
the mixing of chloroform with blood drawn
from the body prevents its coagulation, we
do not find in animals poisoned solely
by an overdose of Chloroform, this to occur;
it is probable in these cases, that the
person was partially, if not entirely,
asphyxiated.
See *Monthly Journal* in Nov. 1848

See *American Journal of Med. Science* January 1852
Pharmaceutical Uses

For the administration of Camphor internally we may obtain a solution by dissolving it in Chloroform which it does very readily. Three drachms of camphor to one of Chloroform. It may be given internally rubbed up with white of egg, coffee, cream, water, etc. For this preparation we can go to the

J. Newhall of Philadelphia recommends a preparation for the internal administration of Chloroform. He made thus:

R.

Chloroform 3; 3
Succ. Qii

Spr. Camph. Qii ad 3; 3

Alum. amomi gutt. Vii

Alcohol 3; 3

Sig. N 25 min.

He says that a fluid drachm of Chloroform corresponds in strength to about 30 or 35 drops of Laudanum. It may be given in doses
* See Samuel July 24th 1862

父. Les Comptes Rendus 1850 Vol IT.
Upon 50 to 75 drops every half hour for hours in succession. That it differs from opium in being prompt as a hypnotic, less degree of cerebral excitement, absence of all stimulus to the circulation, in fact it may be called a "difficille narcotique," he recommends this mode of internal administration because the administration of aromatics prevents the tendency to vomiting.

* Chloropone ointment for hemiplegia and neuralgia.

In Cageneave of Bordeaux recommend as follows:

R.

Chloropone Zii

Grenad Petas Zips

Acrida Zii

White Wax 2 S

Make an ointment of equal consisting.

Mr. Belorquin recommends Chloropin as a test for Iodine.

Take of fluid 10 parts containing 100,000 parts of Iodide of Potassium, and add to
See Santet in July 13 1850

† See Parcia's Matona Media
to it 2 drops of nitric acid, and 15 to 20 drops of sulphuric acid, and one part of chloroform, the chloroform will on shaking assume a distinct purple colour. The ascertaining of the amount of Iodine in organic substances as cod-liver oil may be done much easier by means of chloroform than the test of starch, also an exceedingly debilitating.

*Ointment for Neuralgia *

Chloroform 31
Arsenic 31

Mix in a mortar

Use two or three portions a day upon the painful part. As this ointment is liable to turn yellow when exposed to light it should be kept in a colored wide necked and well stoppered bottle.

A favourite antispasmodic mode of using chloroform internally is in the form called chloric ether. 

Chloroform 31
Rectified 9:31x

One grain adult morning to the two or three times a day, chloroform.
La Gazette Médicale Novembre 1850
Chloroform as an Antiseptic.

If flesh be allowed to steep in Chloroform it becomes of a vermilion colour, and at the end of a week or two it assumes the appearance of boiled meat, and on opening the bottle the meat smells perfectly fresh. If the same experiment be tried with Chloroform ether the meat is found to have become quite putrid. The chloroform is said not to coagulate the albumen, having in this respect an advantage over cresyate. I have repeated the experiments of Magnus and came to the same results. A distinct change was observed immediately the meat was put into the ether but none in the Chloroform and the meat steeped in the ether after a week or two became quite bleached and had a putrid smell. The ether was of a cherry wine colour; that in the chloroform was bleed boiled meat, had a fresh smell, and the chloroform was not coloured. On taking them out of the bottle and
and exposing them to the air, that stood in the chloroform lost all smell, but the other remained impregnated with the smell of ether, as well as the pungent odor it formerly possessed. This preservative power possessed by chloroform might be useful in a practical point of view.

In Klabunder's chloroform a good agent for extracting atropine from belladonna; and also in the separation of cinchonine from cinchon a bark. For full account of these two processes see Les Comptes Rendus Jr. 1850.
Having gone over, as far as I am aware, the different points connected with the subject of chologumm, I must apologize for the insufficient and imperfect manner in which it has been accomplished. Certainly I never felt the words of an old sage like “Proraeciation is the thief of time” so true as on this occasion. But I dare say there are few who have not had some time or another a contest with that never tiring race have time, and who have not thought themselves one of us, when, unfortunately, some accident they break down in some part of the race, and time gains the day. I was my intention, when I commenced, to construct a table containing a statistical account of the various deaths recorded in the journals, which have happened during the administration of chologumm. But here I have been defeated, but this essay has already reached such a large size.
size, that any further additions would only burden the reader; and on account of the length it has extended to, I have taken out the chapter on the objections to the use of anaesthetics, as we now hear little or nothing ever said against their use, owing to the very able and amusing manner in which J. Brown has overthrown the whole of them.

Though the entire composition of this essay I have experienced what Nelson most persons attempting, for the first time found, namely, the very great difficulty of expressing one's thoughts in few words, and this has rendered it unnecessary length.

A. M. J.
Effects on Respiration

Death by Asphyxia

L. 94 Complications

Current Blood