On Expectorants.

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by Henry Dodgson

The term expectorant literally signifies anything that causes the expulsion of matters from the chest, that is, from the respiratory tract. As now commonly used, however, it has a much wider signification than this. It is employed to denote those substances which in any way act upon the bronchial mucous membrane, either by directly or indirectly increasing the secretion, or facilitating the discharge of matters from the bronchial tubes, or by allaying irritation and diminishing cough. The term "antiacs" used by the Ancients corresponds exactly to the modern one of Expectorants. Under the general designation "Antiacts" the ancient physicians included not only Squill and other medicines which possess the property of directly influencing the expectoration, but also the various demulcents (Tragacanth. liquorice. &c.) and anodynes (Opium. Conium. Hyoscyamus) All these medicines were employed by Galen as antiacs, and they, besides many others have been given in recent times as expectorants. The term Expectorant

therefore does not give a very precise idea of the nature of the remedies included under it, or of their modus operandi. Any change now, however, in the designation of this class of remedies would cause more confusion than any corresponding advantage that would arise from it. The following is the meaning that I shall attach to the term "expectorants" in these pages:-

Agents which promote expectoration; influence the amount or character of the bronchial secretion; or allay irritation in the respiratory tract.

This class of remedies is admitted by all authors on the subject to be very uncertain in its action, - at least those remedies belonging to the class which possess the property of directly influencing the quantity of the expectoration. Dr. Cullen admitted only two such medicines, viz. Squill and Tobacco. There can be no doubt however but that others possess similar properties; though none are capable of increasing the secretion to a very large extent, - none are capable of acting as general evacuants.

In the normal condition, the lining membrane of the air passages, - the part viz. on which expectorants

* Cyclopaedia of Anatomy and Physiology.

act, is moistened and lubricated by a small quantity of fluid not unlike a thin solution of Gum. In the Trachea and larger bronchial tubes, this is of the nature of mucus, but in the finer bronchi and in the air cells of the Lungs it is probably a mere secretion, at least there is no evidence that mucous glands exist in these finer bronchi, and certainly they do not exist in the air cells, and according to Dr. Todd the secretion of mucus is confined chiefly to the excretory channels of the glands.*. In the natural state of parts the secretion is merely sufficient to moisten the surface and protect it from the irritating action of the air. When in the normal quantity, as well as when slightly increased, the secretion is removed by the action of "cilia" which exist abundantly on the whole mucous membrane of the air passages, from the Larynx to the ultimate air vesicles. In the smaller bronchi, however, the cilia are not so numerous, and are irregularly distributed and scattered over the surface; in the ultimate air cells they are entirely absent. These cilia are in a constant state of vibration, and invariably play upwards, so as to cause a current in that direction.

* Dr. W. J. Gairdner, in Medical Monthly Journal. Vol. XI.

When the matters contained in the bronchi are in too large quantity to be removed by the ciliary motion, Nature effects their expulsion in another way, after having reached a certain part of the air passages. Viz. by the production of a sudden and forcible blast of air, such as takes place in coughing or "hawking". Besides the vibration of the cilia, another power has been lately proved to cooperate, or even to be the chief agent in, the expulsion of matters contained in the bronchi, viz. the muscular contraction of the bronchial tubes. That the pale fibres, situated in the walls of these tubes, do possess the power of contracting and diminishing their calibre, has been abundantly proved by the experiments of Volkmann, Williams, and others: and there seems to be no doubt that these fibres, by their successive and rhythmical contractions, aid in the expulsion of matters which have accumulated in the bronchi. This is certainly the case in Pathological, and probably also in healthy, states of the tubes.*. It also appears to be established by the experiments of Volkmann that stimuli applied to the Vagus nerve, excite the muscular fibres of the bronchi and

cause them to contract. This, as will be afterwards seen, will serve to explain, to a certain extent at least, the mode in which emetics operate in causing increased expectoration. — In the act of coughing, (by which expectoration is usually effected) a full inspiration is first taken; the Larynx is then closed, to prevent the escape of any air; next the abdominal muscles and Diaphragm begin to contract and press upon the Lungs with their contained air; the Larynx is then suddenly burst (as it were) open, and a forcible explosive blast of air is produced, which carries out along with it any foreign matters that exist in the tubes. Cough is a reflex act, and, like others of the same kind, is adapted to secure a desirable end, in the present instance it is the expulsion of matters from the air passages, which have either obtained entrance from without or have accumulated in too large quantity within the air tubes, and which, if not removed by some such means, would go on increasing in quantity until they caused Asphyxia and death. The presence of any foreign matter in the air passages excites irritation there, and causes an impression to be conveyed along the excitor fibres of

the Pneumo-gastric to the Medulla oblongata, whence an influence is conveyed outwards along the motor nerves supplying the muscles of respiration, the abdominal muscles &c. to excite them to action & produce cough. Cough however may exist independently of expectoration or any disease of the bronchia or Lungs; - merely from irritation in other organs, as the stomach, in which case it is said to be a sympathetic cough.

Expectorants act in different, and even opposite manners. They may be divided, in the first place, into General and local; - that is those which act through the medium of the system and circulation, and those which are brought into immediate contact with the parts to be acted on - topical expectorants.

I. Topical expectorants. These may be sub-divided into, 1st Those which act only on the Fauces and Pharynx, and which are in the fluid form, and 2nd Those which act on the whole extent of the mucous membrane of the air passages. - These are in the form of gas or vapour. - either they exist naturally as gases, or they are raised in vapour by the aid of heat.

1st Topical expectorants acting on the fauces & pharynx. This includes all those remedies (derived from the vegetable kingdom) which possess emolient and demulcent properties, of which the principal are the roots of Glycyrrhiza glabra, and Althea officinalis: the plants Linum usitatissimum, Malva sylvestris (in the form of decoctions &c.); also the mucilage derived from Gum acacia, and Tragacanth; as well as the various kinds of gruels, syrups, and Lozenges.

These act mechanically by lubricating and protecting the dry (in the 1st stage of inflammation) and inflamed surfaces with which they come in contact in the upper part of the respiratory tract. They have also a relaxing effect on these parts, and it is stated by Dr. Pereira that they probably affect the bronchial membrane and Pulmonary structure by reflex action. Cold air acts as a powerful irritant to the inflamed mucous membrane when unprotected by its natural mucous secretion, and this secretion is always deficient, or absent altogether, at the commencement of inflammatory action in the part. These substances can not have any effect on that, much more sym-

- sive portion of the respiratory tract situated be-
- low the Glottis, - except in the way mentioned by
Dr. Pereira - by reflex action. The air however by
the time it reaches the Larynx will have lost some-
-what of its irritating properties. by becoming raised
in temperature: - for it is less stimulating in pro-
-portion as it approaches the temperature of the body.

3rd The other topical expectorants are also
the form of gas or vapour and are brought into contact
with the bronchial mucous membrane by inhalation
along with air. This is accomplished either by simply
breathing them during ordinary respiration, or by means
of an apparatus devised for the purpose. Some of
them (as above mentioned) are naturally gaseous; others,
as water and tar, are rendered gaseous by heat. a
third kind consists of the smoke derived from the com-
-bustion of plants, as tobacco and Stramonium.
A great many substances were formerly used as ex-
-pectorants in the form of gas: - as different parts of the
following plants: - Tobacco, Stramonium. Myrrh, Gum resin,
Also Pitch, volatile oils, water, alcohol, Ether, Ben-
-zoic acid, acetic acid, sulphurous acid, ammonia,

Carbonate of Ammonia, Chlorine and Iodine. Most of these are now obsolete as Expectorants, and all that need be considered here are, Water, Stramonium, Tobacco, Chloroform, Chlorine, and Pitch.

1. Aqua. The vapour of water, when inhaled, acts topically on the mucous membrane of the Larynx and Trachea as an emolient and sedative. If used in the 1st Stage of inflammation, when the membrane is dry, it will, by its relaxing Effect, tend to promote secretion, whilst at the same time it will, by condensation upon it, moisten the tumid and inflamed surface and protect it from the stimulus of the air.

2. Datura Stramonium. The smoke of this plant is occasionally inhaled in pulmonary affections, more frequently however in those of a spasmodic than of an inflammatory character. Its action is that of an antispasmodic and sedative. Its use is almost confined to Spasmodic Asthma, in which it frequently relieves the paroxysm. The first symptom of this relief being usually copious expectoration, Thornapple may be classed among Expectorants; though the proper Explanation of its mode of action, and the

one which is supported by experiments on the lower animals. is that it operates by relieving spasm, and allowing expectoration to take place.

3. Nicotiana tabacum was highly recommended by Dr. Cullen as an expectorant; it is one of the two drugs which he believed to possess direct expectorant virtues. Stack probably in a similar manner to Stramonium. but its effects are not so well marked.

4. Chloroformum. Of late this remedy has been used by inhalation, in various pulmonary affections. It is said to act by lessening the cough and rendering the expectoration looser. This result, which is said invariably to have followed its use in Pneumonia, in some of the German Hospitals. is probably owing more to its sedative and antispasmodic action, than to any power directly promoting expectoration.

5. Chlorinum. The immediate effect of the inhalation of Chlorine, in a much diluted state, is to cause increased expectoration, but ultimately it causes, in Pathological conditions of the Bronchi. a diminution of the sputum. It is said to modify the nature of the expectoration, rendering it less fetid, less viscid, and less irrita-

* Magendie's Formulaire.

†Dr. A. T. Thomson in Cyclopædia of Practical Medicine. (article Expectorants)

-ting; to give the bronchi the energy they needed, and to change the nature of their inter-tion. It action appears to be confined to the morbid surface. * .. Chlorine was at one time inhaled extensively in Phthisis pulmo-nalis, which disease was thought in some instances to have been cured by it. More recent trials however have shewn that it possesses no such power. The inhala-tions are nevertheless useful in some cases of chronic catarrhal affection.

6. The vapour of tar has been used in pulmonary af-fections as an irritant and expectorant. - it in-creases the secretion from the bronchial mucous membrane. Though at one time it enjoyed much celebrity, both in the form of vapour and also as tar water in the treat-ment of Phthisis, it is now seldom used.

Emetics are generally stated to act mechanically in promoting expectoration, and might therefore be con-sidered here. They are said to act by straining and compressing the Lungs, and forcing out in this manner any thing contained in the bronchial tubes. I think however they can not possibly act in this way, as will become evident to any one of the mechanism of vomiting

is for a moment considered: — previous to the act of vomiting a deep inspiration is taken; the glottis is then closed (so as to prevent any escape of air) and remains so until the vomiting has ceased; the abdominal muscles next contract and compress the stomach against the Diaphragm, which, if the deep inspiration immediately preceding, is strongly arched downwards; the stomach thus compressed between two unyielding surfaces, discharges its contents (the cardia being open) into the œsophagus and thence externally. In this explanation the action of the stomach itself has been left out of view (though it does contract upon its contents during the act) since it can obviously have nothing to do with the mechanical expulsion of matters from the bronchi. If this explanation of the act of vomiting is correct, and it is the one generally admitted, it is quite impossible that anything, even air, can escape from the bronchial tubes during the act of vomiting, — since the Larynx remains closed from first to last and whilst this is the case no air can escape from the Lungs, nor can they be at all compressed. — The manner in which Emetics act in producing expectoration will be considered hereafter.

II. General Expectorants. The remedies belonging to this division are much more numerous and important than those already considered. For the most part their action is dependant upon absorption into the system. They may be subdivided into nauseating, stimulating, and sedative expectorants

1. Nauseating Expectorants. Of these the principal are Ipecacuanha, tartarized antimonic, and Squill.

There can be no doubt that a close sympathy subsists between the stomach and the Lungs, as may be readily understood from their both being supplied by branches of the same nerve, viz. the Pneumo-gastric; and is further shewn by the vomiting which frequently takes place at the close of a severe paroxysm of cough. — by sympathetic cough being excited by some irritation seated in the stomach — as Lumbrici. &c.

Emetics were considered to cause the expulsion of matters from the Bronchi mechanically, but, though it is generally admitted that they do cause increased expectoration, I have endeavoured to shew that this cannot be the way in which they act. The expectorant action of emetics may I think be satisfactorily explained

as occurring through the agency of nervous sympathy. It has been pretty satisfactorily proved that irritation of the Vagus nerve causes the bronchi to contract, and that this contraction is instrumental in the expulsion of mucous or other accumulations existing in them. There can be no doubt that irritation of those fibres of the Vagus distributed to the stomach is set up by emetics introduced into it. and it is probable that this irritation is communicated to the fibres distributed to the air-tubes so as to induce them to contract upon and expel their contents. So that expectoration will follow the administration of an emetic if there happens to be any accumulation in the Bronchi at the time. But, besides promoting the expectoration of matters already existing in the air passages, they cause an increased secretion to be poured out there, — in like manner as irritation of other nerves supplying glandular organs, causes greater activity of secretion in these glands. — for example increased flow of Saliva from irritation of the nerves supplying the salivary glands. Some of the unirritating expectorants however, as will be mentioned immediately, have been considered to possess a specific action on the Lungs.

and thus to cause expectoration independently of any sympathy between these organs and the stomach.

Antimonium tartarizatum when given in nauseating or emetic doses causes free secretion of the mucus from the lining membrane of the bronchiæ, and from increasing the vermicular contraction of the tubes promotes expectoration. From the great nausea and depression attending its action as an emetic, its use in this way, to cause expectoration, is limited to the commencement of acute pulmonary diseases, when it probably acts more beneficially as a cardio-stimulant than as an expectorant. In chronic cases attended with debility its use is quite contraindicated. Although it acts more powerfully in large doses, it is not without some expectorant action when given to a less extent; and by some it is administered in doses of from 1/16 to 1/12 of a grain.

Ipecacuanha is probably as highly esteemed as an expectorant as any other medicine. It acts best as such when given in nauseating or emetic doses. Though it, like tartar emetic, has some expectorant action in much smaller doses. Like tartar emetic also it produces, though

not to so great an extent as that drug, considerable de-
-pression of the circulation, when given in nauseating or
emetic doses; and is therefore similarly limited in its
application. The expectorant properties both of
Ipecacuanha and tartarized antimony have been
ascribed by some, not to their action through the medium
of the Pneumogastric nerve, but to a direct and specif-
-ic action on the Lungs. That they do possess some such
action seems probable from the observations and experi-
-ments of Magendie and Ofila, for it is stated by them that
the Lungs of animals killed with Emetina (the active
principle of Ipecacuanha) and tartar emetic present
traces of congestion and inflammation.

Scilla maritima. The bulb of this plant has been
long used as an expectorant in pulmonary affections. It
was used for this purpose by the Greek Physicians. It acts
as an expectorant both in large and small doses, in the former
it causes nausea and vomiting at the same time, in the
latter no other effect is produced except an increase of the
mucous secretion of the Bronchi (at least no unless attends its
action). When given in small doses it is generally considered
to act as a stimulating expectorant, but this stimulant

action. (supposing it to exist,) does not prevent its employment in the acute forms of pulmonary disease. Squill undoubtedly possesses the physiological property of increasing the secretion of the bronchi, unconnected with any nauseant action. As an expectorant it is one of the most highly esteemed and generally employed of all those which have any reputation in the treatment of chest affections. It is very frequently — for the most part in fact — combined with Opium which is believed to increase greatly its expectorant action.

The direct emetics. Sulphate of zinc and Sulphate of Copper have been recommended and used as expectorants in those cases in which the Bronchi are already loaded with mucous or other matters, and they are said to unload these tubes, in such cases, equally well as Antimony or Ipecacuanha. The latter drugs are however, I think, preferable as if the prolonged nausea which they induce the bronchi will be more thoroughly emptied. The direct emetics are very seldom if ever employed, in the present day, as expectorants.

2. Stimulating expectorants. The principal remedies belonging to this division are, the fetid gums Assafoetida, Galbanum and Ammoniacum; the balsams of

Peru and Tolu; Gum Benzoin: Benzoic acid; Senega, Ipecacuanha; Copaiba; Ammonia and other stimulants. Some of these remedies probably act more by their general stimulating properties on the system at large, than by any special action on the bronchial mucous membrane, though most of them are generally considered to have, and no doubt do possess some local action on that membrane. The act of coughing, by which expectoration is effected, is a muscular act requiring a certain amount of strength for its performance: these drugs are generally given in the advanced stages of Catarrh and other Bronchial affections, when the strength has been much reduced either by the severity or a long continuance of the disease. and when therefore a stimulus, such as they can impart, is most needed by the system. At the same time they have a special action on the lining membrane of the air passages by which a more healthy action is set up in it, and the nature of its secretion altered in quality and rendered more consistent. thus approaching more to a healthy state; for (as before mentioned) the Bronchial secretion during inflammation, from being at first thin and acrid, becomes gradually more thick and consistent and diminishes in amount until it is reduced to

* Dr. A. S. Thomson — Locus citatus
loco citato

the natural standard.

The foetid Gums Galbanum and Assafoetida resemble each other in their ~~in their~~ Physiological properties and action. Galbanum is more extensively used as an expectorant than Assafoetida. Besides acting as stimulants they possess anti-spasmodic properties, and may thus act by allaying cough dependent on nervous irritation. These substances, especially Assafoetida, can be detected in the breath after being swallowed, and they therefore probably exert a local stimulant action on the respiratory tract and tend to alter the quality of the bronchial secretion.

Ammoniacum resembles the last two substances in its properties and applications. It is said to act by increasing the energy of the respiratory muscles.* It, as well as Galbanum and Assafoetida, contains a considerable quantity of gum in its composition. So as to form an emulsion with water, in which form these 3 substances are best given as expectorants. When given in this way they may exert a topical action in the upper part of the respiratory passages. The power of directly influencing the expectoration, possessed by the foetid gums is very small, and they are seldom now resorted to as expectorants.

Copaiva. From the known efficacy of this drug in affections of the urethral mucous membrane, it might be expected to prove equally beneficial in the case of other mucous membranes. Reasoning in this manner some have used it in chronic catarrhal affections and in the advanced stages of Phthisis pulmonalis; and it is alleged with well-marked advantage. In the course of its action it enters the circulation, and thus comes in contact with the irritated surfaces of the bronchial tubes, on which it is supposed to act as an alterative and stimulant — setting up a new and efficient kind of action in them. It has not come generally into use as an expectorant.

The balsams of Peru and Tolu, in common with the other remedies classed under this head, possess stimulant properties to which alone they appear to have owed their reputation. (For they are now scarcely ever used in the treatment of pulmonary affections. The balsam of Tolu is still used as an adjunct to other expectorants — only from its agreeable odour.

Gum Benjamin and Benzoic acid. Benjamin was at one time extensively used as a stimulating expectorant, but its reputation has much decreased of late years, and its general use was probably kept up by its agreeable taste and flavour.

In virtue of its stimulant action it possesses properties in common with the other remedies belonging to this class.
The expectorant properties attributed to Benzoin were thought also to be possessed by, or to be owing to, its crystalline principle Benzoic acid, in consequence of which this acid has been introduced into the Tinctura Camphorae Composita, Tinct. Opii camphorata, and Tinct. Opii Ammoniata, but it is now, like the crude gum, little used.

Senega. The root of the Polygala Senega has been highly commended and extensively used as a stimulating expectorant in the latter stages of Bronchitis, &c. It is said to act by stimulating the secretion of the bronchial tubes, in common with other secretions. By most writers on the subject it is spoken of in high terms: thus Dr. Pereira says it is an exceedingly valuable remedy in the latter stages of Bronchitis or Pulmonary inflammation, in debilitated habits, and that it appears to reestablish a healthy condition of the secreting organs: other authors express an equally favourable opinion of its action. I think however that its expectorant powers have been much overrated, and that it possesses little or no power beyond that owing to its stimulant action. It certainly has very little physiological action on the bronchial mu-

* Lectures on the Principles and Practice of Physic

cous membrane. - of this I have satisfied myself from trial of its infusion.

Marrubium vulgare possesses stimulant and expectorant properties - similar to the above. Besides promoting the expectoration, it diminishes the oppression of the chest, relieves dyspnoea, and improves the digestive functions. (Dr. A. T. Thomson) It is now only used in domestic medicine.

Ammonia and its carbonate are powerful diffusible stimulants, and as such are frequently useful in the advanced stages of catarrh, Bronchitis, &c. They act simply by increasing the strength of the patient and thus allowing him to expectorate matters which have accumulated in the air passages from his inability to expel them, and which if left removed might quickly prove fatal by producing Asphyxia. for according to Dr. Watson "a great part of the danger to be apprehended in the advanced period of the disease (Bronchitis) is that the patient may not have muscular power enough to disembarrass his air passages of the phlegm that overloads them; to draw a strong breath, and to achieve a vigorous cough." * Although Ammonia has in all probability no directly expectorant property, but simply acts by giving a "flip to the muscular power", yet copious expectoration

frequently follows its employment in such cases, when symptoms of debility and sinking have begun to show themselves. Other diffusible stimulants will in all probability act equally well as expectorants under similar circumstances. Ammonia is, however, supposed by some persons to exercise a local influence on the Bronchial mucous membrane.

3. The third division of general expectorants or sedatives.

Sedative and anodyne medicines have long been used in the treatment of pulmonary affections. They can scarcely perhaps, as a class, be considered expectorants in the literal sense of the term, (though some of them cause increased secretion from the bronchi); but indirectly they do facilitate expectoration, - for, by allaying the cough for a time, they allow the patient to recruit his strength, and the secretions, at the same time, to accumulate, so that at length when cough does occur the expulsion of the contents of the bronchi is more easily accomplished.

The principal sedative expectorants are Opium, Hyoscyamus, Conium, and Lobelia.

*. Headland on Medicines and their modeg actions.

Opium. This valuable drug enters into the composition of almost every "cough mixture" and is probably in many cases the active ingredient. It operates in two ways:- 1st by increasing mucous secretion from the bronchi: 2nd by allaying irritation and acting as an anodyne. The first of these actions that viz. of promoting the secretion of the lining membrane of the bronchi, has been denied by some high authorities. Dr. Christison states that during the action of a medicinal dose of opium the mucous secretions are suspended. Dr. Pereira also is of opinion that it checks exhalation and mucous secretion. Dr. Headland states that opium in small doses, allays irritability and diminishes spasm and is thus an indirect expectorant, but that in larger doses it acts so powerfully as to render respiration difficult and expectoration impossible.* On the other hand Dr. A. T. Thomson states that it erroneous to suppose that opium diminishes the bronchial exhalation, but that "on the contrary it not only assists other expectorants, but promotes expectoration when given alone," an action, he adds, which is to be attrib-

-uted partly to its increasing the natural secre-
-tion of the mucous membrane, partly to its sedative
property by diminishing the irritability of that mem-
-brane. This last statement is quite in accordance
with what I have myself experienced from small
doses of opium (as ¼ grain) frequently repeated, for
when thus taken it has certainly caused an increase
of the natural secretion of, at least the upper part of,
the respiratory tract. It would be difficult to prove
whether this extended into the bronchi, but if it causes
increased secretion in one part, it will in all likely-
-hood do so over the whole membrane, and it is, to say
the least, improbable that it would cause increased
secretion in one part, and diminish it in another part
of the same membrane. Opium is stated, by those who
not only deny that it operates as an expectorant itself,
but hold that it diminishes mucous secretion, to in-
-crease the expectorant action of other medicines pos-
-sessing them. It is difficult to conceive how two medi-
-cines opposed entirely in their action when given separate-
-ly, should, when combined, promote secretion to a greater
-or extent than can be effected by the expectorant alone

With all deference to the distinguished authorities who are of the opposite opinion, I think that the explanation of this action of opium in increasing the expectorant power of other remedies is owing to its properties of itself (in small doses) the property of increasing the secretion of the mucous lining of the respiratory passages.

The second mode of action of opium, that viz. of allaying irritation and spasm, it proposes in virtue of its anodyne properties. It diminishes the sensibility of the bronchi to irritations, - whether of cold air, or of accumulated secretions, or foreign matters.

In cases where there is a frequent and distressing cough with difficult expectoration and scanty sputa, opium by allaying cough for a time, allows the secretion to accumulate in such quantity as to be more easily expectorated when the cough does occur. The matters already existing in the bronchi will, by their longer detention there, become somewhat inspissated, which will in part account for the increased consistence of the sputa observed to attend the use of opium as an expectorant.

When given in larger doses, as a hypnotic, it also proves beneficial, for, although (in large doses) it stops

*. Gregory – Conspectus Judicii Theologici.

expectoration for a time, afterwards it promotes it most effectually.* The strength will also be recruited after sleep, so that the act of expectoration will be performed with greater ease and facility.

The great value of Opium in Pulmonary affections, is, however more due to its sedative action as regards the cough and all the pain and distress attending it, than to its promoting the secretion or expulsion of matters from the bronchi.

Hyoscyamus is frequently used as a sedative in affections of the chest. It does not appear to possess any local action on the bronchi, but simply acts as a sedative or hypnotic. It is much inferior to, and much less used than Opium for this purpose. Though it may be advantageously substituted for it in cases where that drug produces some idiosyncratic effect, or to avoid the constipation attending the use of Opium. For a free state of the bowels acts beneficially by tending to relieve the bronchial mucous membrane.

Conium maculatum. The actions of this plant, in medicinal doses, have not been accurately determined.

It possesses, however, sedative and anodyne properties and is highly recommended by Rowe in the treatment of coughs. It probably acts in a similar manner to the other remedies of this class. It is seldom employed in these affections in the present day. This is partly owing no doubt to the uncertainty or inertness of its preparations as usually made.

Lobelia inflata. This plant when given in large doses acts as an emetic - and as such will increase the mucous secretions of the bronchi; but it also acts as an antispasmodic and expectorant when given in smaller doses. It is usually given in these smaller doses, and therefore belongs more properly to this order of expectorants than to those acting by the nausea which they induce. It is said to increase the expectoration without exciting cough. From its antispasmodic action, it will be most applicable to those pectoral affections attended with spasm of the bronchial tubes - as Pertussis. It has not come into general use as an expectorant.

Besides the three kinds of general expectorants already mentioned and treated of, another class of remedies - astringents - has been occasionally used in

affections of the Bronchi. They are sometimes employed to diminish excessive secretion. Long continued and profuse secretion and discharge of matters from the bronchi, like other chronic discharges, tends to weaken the constitutional vigour and wear down the strength of even the strongest individuals:- it would therefore be consistent both with sound theory and practice to endeavour to diminish this drain upon the system. After the continuance for some time of this increased secretion, the mucous lining of the bronchi may be considered to be in a weak and relaxed condition,- keeping up the discharge partly from habit (so to speak); and like other surfaces in a similar condition requiring stimulation. All these substances already considered and classed together as stimulating expectorants act partly in this way, for after being absorbed they come into immediate contact with this membrane (as is proved in the case of some of them by their odour being perceptible in the breath) and are thus capable of acting on it locally. The ultimate action of some of the local or topical expectorants also, as chlorine is to diminish the secretion from the bronchi, though they at first cause

increased secretion. Other remedies professing more directly astringent actions, as Acetate of Lead, have been used to check inordinate bronchial secretion. The use of the Acetate of Lead for this purpose has been of decided advantage in some cases. Probably the vegetable astringents Kino, Catechu, and Calumba might prove serviceable under similar circumstances.

Diaphoretics and counter irritants also under some circumstances cause, indirectly, a diminution of the Bronchial secretion and expectoration.

In some cases where a severe and long continued diarrhoea has supervened on Bronchites, a very rapid diminution of, or even entire freedom from both cough and expectoration has followed. It is doubtful, however, whether this could be safely and successfully imitated by art: in most cases it would certainly cause a dangerous reduction of strength, and I am not aware that it has ever been put in practice. ———

Expectorants have little power over the matters already existing in the bronchi – in altering their physical properties & thus rendering them more easily coughed up.

It is probable that the sputum may be rendered thinner by the prolonged inhalation of the vapour of water; and those remedies which allay cough (anodynes) will have an indirect action of inspissating it, by allowing it to remain for a longer time in the bronchi where it will lose part of its moisture by the currents of air passing over it (supposing it does not entirely block up the tubes).

Of the remedies which influence the quality of the matter as secreted — Opium postpones the property of inspissating it, and Emetics and nauseants cause a thinner fluid to be poured out. It is also altered in character — from purulent to mucous — by the stimulating expectorants, in some cases.

As cough usually precedes expectoration, it might be, and indeed has been, proposed to give medicine directly to excite cough (if any such exist) in order to promote expectoration of matters contained in the bronchi. A fit of coughing would no doubt clear the air passages, but it is effected much more safely by the natural efforts, so soon as accumulation has taken place to such an extent as to cause irritation; besides cough is usually the symptom of which the patient complains most, and gives most

annoyance and pain, and it is generally too flegmatic rather than otherwise. Ammonia however may be considered to act in this way, when given in the last stage of Bronchitis, where debility is so extreme as to prevent the patients coughing freely. ———

Having now treated briefly of the principal remedies reputed to possess expectorant properties, it remains for me to consider their application in disease.

Expectorants are never used as general antiphlogistics, by causing a discharge from the bronchial lining membrane. They are not used at all in a healthy state of that membrane, but only, in pulmonary disorders, when it is in a state of irritation or inflammation — in this respect differing from most other evacuant remedies. For the most part they are used only as palliatives, though the stimulating expectorants and astringents undoubtedly act as curative agents in some instances. In routine practice, expectorants are given in almost all cases of cough, without regard to its cause or the lesion giving rise to it.

From this class of remedies being so extensively used, it can not reasonably be doubted that they give relief

in many cases, the great cause of the universal use of expectorants and cough mixture may be readily inferred from the circumstance that a "dry cough" i.e. one unattended with expectoration, or with very slight one, is always more distressing and attended with more pain than when the expectoration is profuse.

Besides being given directly to promote or facilitate expectoration, they are very frequently administered to allay a distressing or severe cough without reference to the sputum. For the quantity of the discharge is never wished to be increased so long as it is easily expelled and without much coughing; on the contrary the decrease of the expectoration under such circumstances, along with increased appetite, is one of the surest signs of a return to health.

With these introductory remarks, I will proceed to the uses of expectorants in the different diseases affecting the Pulmonary organs and in the different stages of these affections. — and 1st of the use of expectorants in

Bronchitis. It is in this disease that expectorants might, on theoretical grounds, be considered of most use, as acting directly on the part affected; and it

consequently the disease in which they have been most extensively used and with most advantage.

In the early stage - at the commencement of the inflammation, when the membrane is yet dry, tumid, and very sensitive to the action of the air, that clinging expectorants which acts mechanically by lubricating and protecting the membrane from irritation from without will be found most beneficial; viz Demulcents and emollients, such as the various Gruels, Syrups, Lozenges, extract of liquorice, &c. The vapour of hot water also may often be used with benefit in this stage, and it possesses an advantage over those just mentioned, that it acts on the whole respiratory tract. In the early stage of the disease, however, - in which demulcents are indicated, - the inflammation is principally confined to the upper part of the membrane, as it usually commences above and extends downwards. These remedies also which have the power of increasing directly the bronchial secretion will be of advantage. Of these the best, when, as is usually the case at the commencement, there are sharp febrile symptoms present, are Antimony and Ipecacuanha

especially the former, for they fulfil a double indication; they act as antiphlogistics and contra-stimulants as well as expectorants. After the inflammatory symptoms have been somewhat subdued and the bronchi begin to pour out a secretion, Opium may be combined with the Ipecacuan or Antimony as, besides subduing cough it tends to inspissate the secretion, which is at first thin and irritating. It must however be given cautiously at first, and its effects watched. It is contra-indicated if there is any blueness of the lips or cheeks, or other signs of deficient arterialisation of the blood.

In Subacute and Chronic Bronchitis in which there is usually profuse expectoration of a thick or otherwise altered mucus, frequently more or less mixed with purulent matter, the Stimulating & Balsamic expectorants are most beneficial, — with or without the addition of Opium.

Under their use the expectoration frequently diminishes in quantity and the patients strength increases.

In the chronic stage, when the expectoration is excessive and much exhaustion and emaciation present, more powerful remedies than these may

be employed:- those only which possess directly astringent properties. The best of these is the acetate of lead, which may be given alone or in combination with Opium, as in the Dil. Plumbi opiate.

In chronic cases of this disease in the aged, or in others where symptoms of debility and sinking have begun to shew themselves, the best results follow the administration of ammonia and its preparations, or wine, especially when the expectoration is checked from inability in the part of the patient to summon the requisite muscular power. The modus operandi of these remedies, under such circumstances is obvious, and has been before explained.

Opium is generally combined with other expectorants in this and other affections of the respiratory organs. It will be found most beneficial when the cough is frequent and distressing as it alleviates this and allows the patient to take some rest which was previously cut off the question from its urgency. It is one of the most valuable remedies for subduing irritation and allaying cough in chronic cases unattended with constitutional excitement, but it is difficult to discontinue it after having been used for some time.

Pertussis. The class of expectorants which have been found most useful in this disease are those which cause nausea and vomiting. The paroxysms of cough are frequently or even generally terminated by vomiting of the expectoration, or both combined. The observation of this has no doubt led to the use of these remedies which facilitate the natural termination of the paroxysm. The best nauseating expectorants that can be given are Ipecacuanha and Antimonium tartarized antimony — in small doses frequently repeated. When the expectoration is scanty and the cough preceding it very prolonged and severe, emetics have been found of more service. By some they are recommended in ordinary cases of the disease; but they should not be given when there is any determination to the head, as the obstruction to the venous return, which necessarily occurs during prolonged vomiting, might induce convulsions which is one of the most serious and dangerous complications of whooping cough. — Opiates in this affection are often extremely useful to allay the distressing cough.

Spasmodic asthma. In this disease there is not necessarily any organic disease of the bronchi or Lungs themselves. It consists essentially of spas-

-modic construction of the bronchial tubes. It can scarcely be said that Expectorants are of any use in this disease, - at least those of them which directly influence the Expectoration; but as the paroxysm is for the most part (in the humoural variety) terminated by free expectoration, those remedies which have the power of cutting short the paroxysm may be considered as indirect Expectorants - though the increased bronchial secretion is the consequence and not the cause of the relief to the dyspnoea. It is in this disease that the vapour of Stramonium and Tobacco have been found particularly beneficial. Stramonium in some cases of Spasmodic Asthma almost immediately arrests the paroxysm, in other cases however it entirely fails to do so, or to afford relief even. It is said to succeed best in those cases in which it excites free expectoration; but as above stated the expectoration is consequent upon the relief afforded to the breathing, from relaxation of the spasm in the tubes.

Inhalation of the vapour of Chloroform has, in some cases, been found at once to relax the spasmodic constriction, and afford complete relief. Inhalation of the fumes of burning nitre is, in other cases of great

service. Remedies possessing anodyne and antispasmodic properties in many cases act very beneficially - especially sulphuric ether and Opium either separately or combined

In Pleurisy there is little or no expectoration attending the cough, unless the disease is complicated with Bronchitis or Pneumonia. As there is no affection of the bronchi in this disease, or strictly speaking of the lung itself, there is no indication for the use of expectorants (except perhaps such as tend to relieve cough, or diminish the pain attending it).
When complicated with Bronchitis the expectorants indicated in that disease must be employed.

Pneumonia. This disease consists essentially in an exudation of liquor sanguinis into the air vesicles of the Lungs and finer bronchi and its coagulation there. As the deposit softens and breaks down it requires either to be removed by absorption or by expectoration; it might therefore be supposed that expectorants here would be of decided service. These remedies however affect only the Bronchi and have no influence over the ultimate air vesicles or finer bronchia. It is true that an

* Prof. Simpson's Contributions to Obstetric Pathology and Practice. (Part I.)

remedy possessing an expectorant action viz. turbentine is frequently of the greatest service in Pneumonia but its good effects are not with any show of reason, ascribed to its expectorant action — but rather to its power of subduing inflammation and acting as a contro-stimulant — Expectorants are sometimes given during the course of the disease; and when it has become chronic stimulants may be employed to promote expectoration in the way previously explained.

Of late the vapour of Chloroform has been employed in the treatment of Pneumonia by some of the German physicians, and besides other advantages resulting from its use, it is said that, in 23 cases treated by Varrentrapp, in all without exception the cough was lessened by the inhalation, the intervals between the coughs shortening, and the cough itself being less violent and the expectoration looser, and gradually diminishing in quantity.*

If similar results are obtained on more extended trials of it, Chloroform will no doubt come into general use in the treatment of Pneumonia, and prove a valuable auxiliary to the other means already employed in subduing it.

Phthisis pulmonalis. It can not be a matter of surprise that, in this disease which very frequently resists all kinds of treatment, expectorants should have been extensively employed. In common with many other remedies, possessing the most opposite properties, expectorants have been lauded, not only as palliatives of the symptoms, but as capable of curing the disease itself.

The curative indication has been endeavoured to be carried out by means of emetics. — This class of remedies has long been recommended in the early stages of Phthisis to effect mechanically the dislodgement and expulsion of the tubercular matter existing in the air vesicles and smaller bronchial tubes. It is impossible however, that this can be effected in the way in which the older authors supposed — from compression of the Lungs during vomiting: and there is no evidence of its taking place at all under the use of emetics. — Other drugs also, at one time possessed a reputation for the cure of Phthisis: of these the most in vogue were inhalations of Chlorine, and Tar both in the form of vapour and as tar water.

Allowing that cures did occur under the use of these substances, it does not follow that they were really

cures of Phthisis, for the means of diagnosis of this from other diseases - especially Bronchitis - were then much less certain than now, and, even at the present day with all the assistance that can be derived from acoustic signs, Bronchitis is sometimes mistaken for advanced Phthisis, - & vice versa.

Be this as it may, Tar water & vapour and the inhalations of chlorine have long ceased to have a reputation for the cure of Phthisis, though in some cases their use is attended with benefit. — The principal use of expectorants in this disease is to alleviate cough. For this purpose emollients and demulcents may be employed with occasional and partial relief, but a more certain remedy for this purpose is Opium, or its preparations. In many cases this drug is almost indispensable in order to allow the patient, harrassed and exhausted by frequent cough, to obtain a little rest and sleep. In some cases where the expectoration is very profuse astringents may be employed with advantage.

Some accomplished physicians maintain that expectorants should not be given in the early stages of Phthisis as they tend to keep up the expectoration. This objection is founded on the observation that when the disease is

arrested at this (or indeed any) stage, the expectoration becomes more scanty, and the cough preceding it, though less frequent, is more distressing to the patient and attended with more pain; therefore it is argued that as this pain accompanies a salutary change and amendment in the disease – it should not be interfered with by art. It is difficult to conceive how any sedative or anodyne remedies given to diminish the cough or pain attending it, can, under such circumstances, have any tendency to arrest the natural progress towards cure. The slight increase of the mucous secretion of the Bronchi, can certainly have no such deleterious effect, and it will increase very little the absolute quantity of the sputum. I think therefore that such palliatives should be given, as there is no good grounds for the apprehension that they will arrest the cure; – except they should interfere with the digestive functions: if this should be the case, they ought certainly to be discontinued, or others substituted for those that disagree with the patient. ———