THE

JOURNAL OF LARYNGOLOGY AND RHINOLOGY.

VOL. I. JULY, 1887. No. 7.

THE TREATMENT OF PHTHISIS.

IN the light of modern pathology, we must regard phthisis as a bacillary disease, and the serious constitutional symptoms as primarily induced by the growth and development of this bacillus. When we come to interrogate the mode of action of the bacillus we are, however, met with difficulties. We have, indeed, two great factors—viz., a local lesion, consisting of tissue change, ending in two ways, according as the process is rapid or slow, the ultimate result being in the one case, ulceration and destruction, and, in the other, organization and fibroid change; and besides the local lesion, we have a chemical process, which involves the poisoning of the whole organism. Many pathologists, indeed, now regard the phthisical process as one in which there is a local lesion, with the production of a general state of septicæmia. Whether bacillary poisoning is produced through the manufacture of ptomaines, or the "ferment intoxication" or other chemical processes, is one of the most vitally interesting, if also one of the most obscure points, in chemical pathology. The general condition is, however, one of septicæmia.

The indications in the treatment of pulmonary phthisis would therefore appear to be—1st, to arrest local action; and 2nd, to alleviate the general condition consequent upon the local lesion. The first indication may be met by destroying the bacillus, which is the *fons et origo mali*, or by putting the tissues into such a resistant condition that they are enabled to withstand the ravages of the parasite by rendering its surroundings unsuitable. The means taken to produce the one effect cannot fail to accomplish the other. To this end prophylactic measures become of prime importance, and the earlier they are adopted to combat the "phthisical tendency," the greater is the hope of success. To such means must we look as will aid pulmonary expansion, such as the pneumatic apparatus and inspirations of compressed air, for the purpose of accomplishing increase in the intra-pulmonary pressure, with consequent expansion

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of the chest, and gain in the functional activity of the lungs. The same effect is obtained by causing the patient to expire into rarefied air, and for this purpose physicians have lately looked to residence in high altitudes as an effective prophylactic measure. For the same purposes "respiratory gymnastics" and the "pneumatic cabinet" are employed. But, supposing the tissues to be already invaded, the bacillus firmly seated, and its ravages already past simple prophylactic measures, what is to be done? We naturally turn to anti-bacillary methods and antiseptic medication, and it has been sought to accomplish this end by—1, pulmonary inhalation; 2, internal medication through the stomach; 3, direct injections into the pulmonary tissues; and lastly, 4, by rectal injections.

In pulmonary inhalations it is not unlikely, as pointed out by Hassall, that a large part of what is introduced through the mouth does not reach the lungs at all, but no one can deny that benefit is derived from the use of antiseptic inhalations such as carbolic acid, creosote, iodine, eucalyptol, iodoform, the essential oils, such as pine, &c. Continuous inhalation may be obtained by the employment of medicated respirators. With regard to the inhalation of gases, such as sulphuretted hydrogen (obtained at such spas as Aix-la-Chapelle, Eaux Bonnes, Cauteret, Luchon, Harrogate, &c.), carbonic acid (as obtained at Ems, Franzenbad, Kronthal, &c.), certain beneficial effects are recorded by balneo-therapists, and H^2S is particularly said to diminish the frequency of the pulse, calm the dry irritative cough, aid expectoration, and promote a feeling of exhilaration; while CO^2 is said to be invigorating and stimulating. While great effects have been claimed from the inhalation of oxygen and nitrogen, it is really doubtful how far these reputed results are reliable. Pulmonary inhalations of gases or medicated vapours, while undoubtedly very serviceable, have not accomplished the success that might have been expected from them in the treatment of phthisis. We have lately heard propounded a mode of treatment of pulmonary disorders, and especially phthisis, which, while certainly raising our scepticism, cannot, in the light of very recent experience, be so readily dismissed. In 1886, Bergeon,[1] of Lyons, published a plan of treating pulmonary phthisis by the rectal injections of gases. The method has been adopted extensively in France and America, and one is bound to accept the gratifying reports of the many well-known physicians,[2]

[1] In a paper presented to the French Academy of Sciences, July 12, 1886, and Congress for the Advancement of Science, August 12, 1886.

[2] Osler, Solis Cohen, and others in America; Chantemesse, Vuillet, Garel, Queyrel, Renault, Cornil, and others in France; Burney Yeo, Bennet, Coghill, &c., in England, and many others.

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whose preconceived and natural dislike and scepticism has yielded to very favourable considerations of Bergeon's method. The method, which consists of injections per rectum of sulphuretted hydrogen gas combined with carbonic acid gas, or of the latter gas alone, is founded on the assumption that it would poison the individual to administer a dose of any antiseptic inhalation by the lungs directly, sufficiently large to kill the bacilli, since such medicaments directly enter the pulmonary arterial system, and toxic substances introduced in this manner act very rapidly and fatally. Cl. Bernard long ago showed, however, that large quantities of sulphuretted hydrogen could be introduced through the digestive tract, or into the venous system, with impunity, provided the injections were not made in too great quantity at a time. The good effects of carbonic acid gas in phthisis and asthma had already been noted long ago, by Demarquay and others, and seltzer water had been injected into the intestine in quarts, and even bicarbonate of soda along with tartaric acid, in order to obtain production of CO^2 *in situ*, and distension of the intestine by the gas in cases of intestinal obstruction. Large quantities of sulphuretted hydrogen might be administered by the stomach, but such medication, of necessity, disorders the digestive organs, and prevents proper assimilation of food. Consequently the method is inapplicable, but there is no doubt that large quantities of these gases can be introduced into the lower alimentary tract with perfect safety, and being received directly into the venous circulation, are carried through the portal system, hepatic veins, and right heart directly to the lungs, where they are brought into contact with the diseased pulmonary tissue, and exhaled through this channel without producing any untoward effect. This plan is therefore the most likely to succeed in producing direct medication of the lung tissue. When we look for clinical evidence of the beneficial effects of this method, we find a mass of recently accumulated literature, and making due allowance for the exaggeration which accompanies enthusiasm in therapeutics, and for the fact that temporary good results habitually follow new methods of treatment, we are bound to confess that the method is rational, and that reports from various quarters where it has been adopted lead to the inevitable conclusion that Bergeon's method is a distinct advance in the science of respiratory therapeutics.

Bergeon employed chlorine, turpentine, ether, ammonia, bromine, iodoform, and eucalyptol for rectal injection, but finding that inflammation, and even sphacelus, of the intestine resulted from their irritant action, abandoned all these for the mixture of sulphuretted

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hydrogen and carbon dioxide. He concluded that the latter gas lessened the irritant action of the sulphur, which in turn is a microbicide. This, however, at least seems to be certain, that the sulphuretted hydrogen does not kill the tubercle bacilli, for, according to clinical evidence, they are as numerous in the sputum of phthisical patients under treatment as before the injections were begun. While some[1] are inclined to attribute the good effects to the action of the sulphur upon the inflamed lung tissue, denying its parasiticidal action, others, and from our short experience of the method we are inclined to agree with them, consider the carbon dioxide to be quite as effective alone as the admixture of the gases. Chantemesse and Ballet[2] have, indeed, employed carbon bisulphide with excellent results.

The cases in which these rectal injections may be employed with every hope of success, and this appears to have been sometimes striking (H. C. Wood, Solis-Cohen, and others), are not only phthisical, but asthma, with chronic catarrh and emphysema, and even catarrhal pneumonia, bronchitis, whooping cough, and pulmonary catarrh. Dr. Wood states that he saw one case of catarrhal pneumonia with an enormous amount of purulent expectoration, and general symptoms so bad that a fatal prognosis had been given, in which the administration of the remedy was at once followed by rapid lessening, and even cessation of the purulent secretion, and in a short time by convalescence. He cites another case of pleurisy and broncho-pneumonia in which a fatal prognosis had been given, and in which the expectoration, previously amounting at times to a pint in twenty-four hours, was notably decreased by gaseous injections within forty-eight hours, and convalescence followed.

Ramon de Fougeray[3] maintains that rectal injections are the best of all treatment for hæmoptysis, attributing the good effects, however, to the carbonic acid. Thiery and Renault[4] have employed the mixture of $CO^2 + H^2S$ in phthisis, and the CO^2 alone in emphysema complicated with bronchial catarrh. There is physiological evidence that CO^2, in small quantities, stimulates the respiration and the pulmonary circulation, either by direct stimulation of the medulla (Germain-Sée) or by increasing the contractility of smooth muscle (Brown-Séquard). In so doing, the plethora of the bronchial circulation, and the bronchial catarrh consequent on such a condition

[1] Dr. H. C. Wood, *Therapeutic Gazette*, April, 1887.
[2] *Gaz. des Hop.*, Feb. 3, 1887, p. 117.
[3] *Gaz. des Hop.*, Feb. 12, 1887.
[4] *Gaz. des. Hop.*, 1887, p. 112.

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is relieved by the emptying of over-distended pulmonary alveoli, and reopening of pulmonary capillaries closed through such distension. In conditions such as phthisis, where there is a large surface of inflamed lung tissue, it is possible that the direct application of sulphur to the tissues is followed, as is pointed out by Dr. H. C. Wood,[1] by the rapidly beneficial effects noticed from the application of sulphur to mucous membranes generally, and it is to this agent, and not to the carbon dioxide, that the beneficial effects must probably be attributed. S. Solis-Cohen[2] related a case of asthma in which striking relief followed the gaseous injections, confirmatory of the similar observations contained in Morel's[3] brochure.

The good results claimed for the treatment are: diminution of temperature and of night sweats, of cough and expectoration, arrest of hæmoptysis, promotion of appetite, strength, and a general feeling of well-being, with arrest of inflammatory and suppurative processes in the lungs, and control of the septicæmic process. Bergeon claims to have observed cicatrization of cavities and cure of ulcerations in patients under this treatment.

The method of administering the gas is of importance. The invention of the original apparatus has been followed by the introduction of others. We have now the apparatus of Morel, Sehet (in which regulation of the quantity of gas injected is permissible), Gallante, Kyner (made for Dr. Solis-Cohen), and lastly, of Faucher. The last is quite new, and appears to possess considerable advantages over the others. Its action is automatic, the liberation of gas is slow, so as not to give rise to distension, the quantities of gas employed are regulated by the dose of the salts used, and, most particularly, the patient can readily use the apparatus himself. Lecorché and Cornil speak highly of the apparatus. A simple appliance has been suggested and used by Dr. Bracken:[4] "An ordinary siphon bottle of carbonic acid gas and water, a pound bottle containing the sulphide in solution, closely corked, and containing a long inlet and short outlet tube, both of glass; a rubber tube attached to the siphon connecting it with the bottle containing the sulphide solution, and the tubing with the metal tip of an ordinary fountain syringe conveying the sulphuretted hydrogen from this bottle, where it is generated, to the rectum. The siphon being inverted and the cock opened the carbonic acid gas escapes, and the supply can be regulated

[1] *Ther. Gazette*, April, 1887.
[2] *N. Y. Med. Journal*, May 28, 1887.
[3] *Nouveau Traitement*, &c. Masson, 1886.
[4] *Med. News*, May 7, 1887.

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easily. The ordinary siphons obtained at a chemist's will serve for two or more enemata, and one attendant can readily invert the siphon and watch the effect on the patient, while the latter controls the rectal tube." It is said that the natural mineral waters are better than the artificially prepared gaseous solutions, being more effective, and causing less pain; such as red sulphur springs, Mount Clemmens, Sharon Springs, Belcher water, or Eaux Bonnes, Cauterets, and Challes water, which are preferred in France. The artificially prepared gas may be obtained from the following formula, which has been extensively employed in the Philadelphia hospital :—

℞ Sodium sulphide (pure),
Sodium chloride (pure) ... āā gr. v.
Water ... ... ʒxxii. ℿ.

(About ten grains of each are put into the Woulffe's bottle, through which the CO^2 passes. Each patient receives at each treatment from three to five pints of CO^2, the quantity of H^2S being unknown, variable, and small.[1])

Or, if a stronger solution is required :—

℞ Sodium sulphide (pure) ... gr. x.
Dilute hydrochloric acid, U.S.P. ℿ xxx.
Water ... ... ʒxxii.

Keep on hand for use, and freshen up with both from time to time. The probable reaction is $Na^2S + H^2CO^3 = Na^2CO^3 + H^2S$.

The solutions employed in the Hôpital Cochin are :—

1. Pure sulphide of sodium, 10 grammes (or 10 parts by weight)
Distilled water enough to make 100 c.c. (or 100 parts by weight).

One c.c. disengages exactly 10 c.c. of H^2S, when the following solution is added :—

2. Tartaric acid, 25 grammes (25 parts by weight).
Salicylic acid, 1 gramme (1 part by weight).
Distilled water to 100 c.c. (100 parts by weight).

Fifteen c.c. of the two solutions, mixed with 250 grammes of water, yield 150 cubic centimetres of H^2S, and is similar to a litre of Challes water.[2] Four to five litres of carbonic acid gas are also employed. Bergeon[3] himself preferred the Eaux Bonnes or Challes water.

[1] Wood : *Therap. Gaz.*, April, 1887.
[2] Dujardin-Beaumetz : *Société de Thérapeutique*, December 22, 1886, and *Progrès Médical*, Jan. 8, 1887.
[3] *Prog. Méd.*, Jan. 29, 1887, p. 97.

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If instead of sulphuretted hydrogen, medicaments, such as iodo form carbon disulphide, eucalyptol, &c., are used, the wash-bottle is replaced by a glass tube, and the medicament is placed between two tampons of cotton wool, the ends of the tube being closed with rubber stoppers; the CO^2 is made to pass through one end, and is thus charged with the medicament; the other end is connected with the rectal nozzle.

With the apparatus sold by Gallante, cartouches of tartaric acid and bicarbonate of soda are supplied, each of which will fill the gas holder to the extent of 5 litres of CO^2; this gas is passed through a bottle containing the sulphuretted hydrogen (in the form of Eaux Bonnes sulphuretted mineral water). These different apparatus are best understood by reference to the original brochures, where illustrations and descriptions are to be found.

The amount of sulphuretted hydrogen that will poison a dog at once, appears from Peyron's experiments to be 150 c.c. Morel says that the dose for a man should be 25 c.c. Caution must be used in the employment of the gas. Dr. Wood states that in the University Hospital in Philadelphia, about a quart of a mixture containing equal parts of CO^2 and H^2S injected into the rectum of a patient produced unconsciousness, and almost fatal symptoms within three minutes. A fatal result has already been recorded. Until it is seen that the patient can stand the injections, and until the dose has been regulated, it would appear wisdom not to entrust the treatment to any but those who are scientifically acquainted with its rationale and possible consequences. The rules laid down by Morel[1] were: 1. The breathing must be watched during the whole time of the injection; any deficiency of respiratory power indicates diminished power to exhale the gas, and the injections should be regulated accordingly. 2. The quantity of H^2S injected should be small, and not more than 25 c.c. at a time. 3. The resistance to the entry of the gas into the rectum should be noted, and no undue pressure made upon the injecting bulb. 4. The injection should be made slowly, and with pauses between each closure of the bulb, so as to ensure complete absorption and exhalation, and avoid accumulation of the gas in the intestine. 5. About twenty to thirty minutes should be employed over each injection. 6. The rectal injections should be made three or four hours after meals, or a little before them. 7. At first only 3 litres of CO^2 should be employed, afterwards 6 litres may be employed—morning and evening.

[1] Morel: *Nouveau traitement des affections des voies respiratoires, &c.* Masson, 1886.

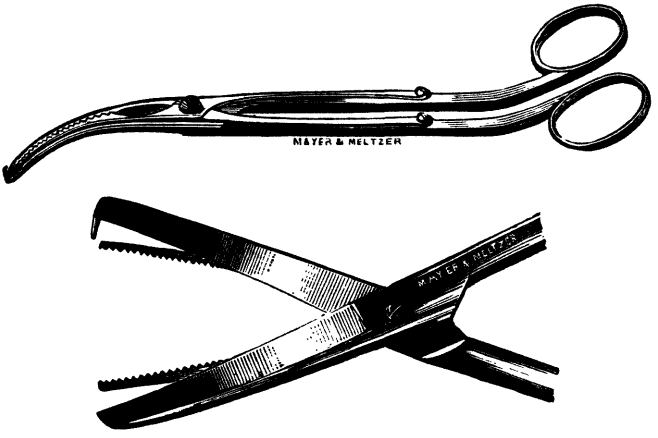
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Many observations are at hand to show the advantages of the method in pulmonary complaints. We want well-recorded results of the plan employed for the most distressing form of phthisis, viz., laryngeal phthisis. It is doubtful whether the rectal injections are really any more efficacious than the administration of sulphuretted hydrogen by other less objectionable methods. Very excellent results have been claimed for the administration of H^2S by means of the stomach, and Dr. Wood recently recorded his opinion that the administration of half an ounce to one ounce of saturated H^2S solution in a tumbler with two or three ounces of CO^2 water run into it from a highly charged siphon, and given three to five times a day, is quite as effective as the rectal injection. We have ourselves recently obtained most beneficial results from the administration of Eaux Bonnes and CO^2 water, in a case of asthma with pulmonary catarrh and emphysema, in which ordinary remedies failed. The methods may sometimes be combined with advantage. Our own experience, derived from experiments in progress at the Throat Hospital in London, has led us to think well of the new treatment, and to endorse the opinion expressed by Cohen before the Philadelphia County Medical Society, "That sufficient evidence exists to demonstrate its value as a legitimate therapeutic measure." R. N. W.

INSTRUMENTS AND THERAPEUTICS.

MACDONALD, GREVILLE.—A New Uvulatome. *Lancet, May* 7, 1887.

THE object of the instrument is to leave the cut surface on the



posterior aspect of the uvula, without drawing the latter forwards

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