

pneumonia, and if their number is sufficiently great to escape what protective elements are present.

Metchnikoff, Bordet, Ehrlich, Morgenroth, Zimmermann, and others are in accord as to the fact that it is this substance which enables the complement (the trypsinlike agent in the blood) to destroy wornout blood-cells, bacteria, etc. The complement being endowed, according to Ehrlich, with digestive powers, the immune body brings it into contact with the pathogenic elements, and these are dissolved. It is as certain that leucocytes containing this trypsinlike ferment and capable of shedding their nucleoproteid granules are present in the alveoli. Finally, since it is here as I have shown that the adrenal secretion becomes converted into adrenoxidase, it is here that this substance must be endowed with its highest efficiency.

The *micrococcus* or *diplococcus lanceolatus* of Fränkel is generally considered as the specific organism. It has been found in all portions of the respiratory tract, and in healthy individuals in the mouth, nose, Eustachian tubes, and larynx, and may persist a long time in the saliva of persons who have suffered from the disease. These organisms, and others that may be present in the air inhaled, pullulate in the bronchial fluids and even in those of the alveoli when the local defenses are inadequate.

Andrew H. Smith⁴⁵ compares infection to a "process of germ-culture going on in a culture medium, each air-cell acting as a tiny test-tube, and filled with this culture medium." Pasteur and Netter have found the *micrococcus lanceolatus* in the buccal secretions of 20 per cent. of well persons and accept Grossmann's view⁴⁶ that the pathogenic microorganisms of pneumonia are "drawn downward into the respiratory tract by aspiration during ether narcosis," the type, we have seen, of existing conditions provoked by a reduction of the temperature in the alveoli, however produced.

The *pneumococcus* of Friedländer is another organism thought capable of provoking pneumonia. It differs from the *diplococcus lanceolatus* in being single instead of in pairs, and in being oval instead of pointed at one end, *i.e.*, "lance"-shaped. In some cases it is the only bacillus found. When this bacillus penetrates the blood the case is greatly aggravated. It is also found in pure culture in the various organs which become the seat of complications. It is often present in connection with pyogenic organisms, especially the streptococcus. Hence the name "streptococcus pneumonia" given to some cases of the disease.

⁴⁵ A. H. Smith: Medical Record, Nov. 18, 1899.

⁴⁶ Grossmann: Deut. med. Woch., Bd. xxi, 462, 1895.

That cases in which the pneumococcus is found in the blood offer a very unfavorable prognosis was noted by Sello.⁴⁷ Of 12 out of 48 cases (selected from a series of 750) in which it was present, 10 died. Of the balance of his cases, 36 in which the pneumococcus was not found but 7 died. This was confirmed by Cole⁴⁸ after a study of the blood of 129 cases, and of the literature of the subject. "The organisms obtained from the more severe and fatal cases" were "either more numerous or more resistant to unfavorable conditions." Sachs⁴⁹ witnessed a case in which practically all organs were the seat of abscesses due to the organism. Instances in which it was found alone in the tissues and lungs, have been reported by Philippi,⁵⁰ Stühlern⁵¹ and others. In a report of an epidemic at the Leavesden Asylum, Sinigar⁵² emphasizes the virulence of this organism. Interpreted from my standpoint, the presence of any bacillus in the circulation means insufficiency of the adrenal system and a marked diminution of the blood's bactericidal properties. Indeed, Müller⁵³ observed experimentally "destruction of the bacteria by the juices of the lungs."

Treatment.—This may be divided into two general indications: (1) to enhance by appropriate remedies the protective activity of the blood's immunizing cells and fluids, and (2) to sustain the efficiency of the protective resources of the body by measures which are known to preserve the physiological fluidity and osmotic properties of the blood.

AGENTS WHICH ENHANCE THE ACTIVITY OF THE IMMUNIZING PROCESS.—The efficiency of the blood's bactericidal and antitoxic properties can be increased by the use of agents which enhance the functional activity of the adrenal system and simultaneously tend to inhibit the multiplication of bacteria in the lungs.*

Creosote carbonate, administered *early*, is as nearly a specific in pneumonia as quinine is in malaria, provided sufficiently large doses, 10 to 15 grains (0.6 to 1.0 gm.) be given frequently enough, *i.e.*, every two or three hours. It is in fact the physiological specific of pneumonia, since by depressing the sympathetic center it causes dilation of the arterioles, thus enabling arterial blood to circulate with greater freedom through the diseased area; while by stimulating the test-organ and thus promoting the production of auto-antitoxin, it enhances the destruction of the pathogenic germs and their toxins.*

* Author's conclusion.

⁴⁷ Sello: Zeit. f. klin. Med., Bd. xxxvi, S. 112, 1899.

⁴⁸ Cole: Johns Hopkins Hosp. Bull., June, 1902.

⁴⁹ Sachs: Zeit. f. Heilk., Bd. xxiii, S. 384, 1902.

⁵⁰ Philippi: Münch. med. Woch., Bd. xlix, S. 1884, 1902.

⁵¹ Stühlern: Cent. f. Bakt., Bd. xxxvi, S. 493, 1904.

⁵² Sinigar: Lancet, Jan. 17, 1903.

⁵³ Müller: Deut. Archiv f. klin. Med., Bd. lxxi, S. 513, 1901.

Creosote carbonate produces no gastric disorders, and although the urine is sometimes rendered smoky, it causes no renal or cystic disturbance, even when the above doses are increased two or three times. The accumulation of toxins which occurs under other treatments does not take place, owing to the *feeble resistance of the specific organism* of pneumonia and the influence of the remedy, and the crisis is often replaced by lysis. The fever may, in fact, disappear within forty-eight hours. It is usually given in a solution of glycerine and peppermint water, but, though an oily liquid, it may be readily given in capsules, followed by a mouthful of water. It must be continued some time after subsidence of the fever, to avoid recurrence.

The use of this agent in pneumonia was introduced by Cassoute of Marseilles in 1898, and it has grown to be regarded by many observers, including A. H. Smith⁵⁴ and W. H. Thomson,⁵⁵ as the most efficacious remedy at our disposal. In a series of 1130 cases treated by various practitioners and collected by I. L. Van Zandt⁵⁶ the mortality was only 5 per cent. In sixteen personal cases Van Zandt had no deaths. Tuttle and Carter⁵⁷ recently reported 600 cases treated by them in six years. It reduced their mortality from 22.8 to 7 per cent. Baldwin, of Rome,⁵⁸ who gives as much as 30 to 40 minims (2 to 2½ gm.) every three hours, had 18 consecutive cases without a death, while the prevailing type of the disease was fatal. Scott and Montgomery⁵⁹ had a mortality of 14.9 in 67 cases. But they gave it every four hours only, whereas the other observers named gave it oftener, *i.e.*, every 2 or 3 hours, thus sustaining the bactericidal action of the remedy. Equally good results are obtained in children as shown in the series of cases reported by Seifert,⁶⁰ Louis Fischer,⁶¹ and several European observers. Conversely, C. F. Stokes of the Navy⁶² gave creosote carbonate successfully in cases ranging from 25 to 74 years, the latter being a very severe case. Wilcox⁶³ treated 33 cases without a death—avoiding all other drugs. It has been highly recommended by J. B. Philips,⁶⁴ Burdett O'Connor,⁶⁵ Fletcher,⁶⁶ and others. Beverley Robinson⁶⁷ considers creosote vaporized in the patient's room valuable as a prophylactic.

Sodium salicylate has properties similar to creosote carbonate, and has given equally good results. By exciting the test-organ it provokes an increase of auto-antitoxin, including

⁵⁴ A. H. Smith: Med. Rec., Mar. 15, 1902.

⁵⁵ W. H. Thomson: *Ibid.*, Feb. 1, 1902.

⁵⁶ I. L. Van Zandt: *Ibid.*, Oct. 18, 1902.

⁵⁷ Tuttle and Carter: Cited by A. H. Smith: Amer. Therap., Jan. 15, 1905.

⁵⁸ Baldwin: *Ibid.*

⁵⁹ Scott and Montgomery: Therap. Gaz., Dec. 15, 1903.

⁶⁰ Seifert: N. Y. Lancet, Dec., 1899.

⁶¹ Louis Fischer: Archives of Pediatrics, Feb., 1903.

⁶² C. F. Stokes: Brooklyn Med. Jour., Aug., 1900.

⁶³ Wilcox: Amer. Jour. Med. Sci., Sept., 1902.

⁶⁴ J. B. Philips: Carolina Med. Jour., Nov., 1906.

⁶⁵ Burdett O'Connor: Northwest Medicine, Feb., 1906.

⁶⁶ Fletcher: Canada Lancet, Feb., 1907.

⁶⁷ Beverley Robinson: Medical Record, Apr. 7, 1906.

thyroidase, in the blood, and by exciting simultaneously the sympathetic center, causes the arterioles to propel the blood with increased vigor into the diseased area, thus enhancing markedly the bacteriolytic and antitoxic process.* But it often provokes excessive sweating, tinnitus aurium, severe headache, and sometimes hæmaturia. It is also contraindicated when cardiac lesions are present. Conversely, it reduces the pleuritic pain and the thirst causes defervescence by lysis and greatly reduces the severity of the disease. It may be given in 8 to 10-grain (0.5 to 0.66 gm.) doses, every two hours, to adults, when creosote carbonate is not obtainable.

Although Talamon and Lecorché⁶⁸ failed to hasten defervescence, DeBecker⁶⁹ found it exceptionally valuable in infantile pneumonia. Sebring⁷⁰ had only one death in 100 cases, some of which received the salicylate alone. It is also recommended by Sir Hermann Weber⁷¹ and DeBecker. Pye Smith⁷² limits its use to cases complicated with rheumatism. F. D. Reese⁷³ recently reported twenty-one cases of pneumonia with but two deaths, one of the fatal cases being a woman of 83 years.

Among other agents of this class which have been tried and abandoned are *creosote*, *carbolic acid*, *eucalyptol*, and *naphthol*, owing to the irritating action on the kidney.

Quinine likewise floods the diseased area with blood rich in auto-antitoxin.* But this result is not obtained with small doses, since these only excite the vasomotor center and raise the blood-pressure.* Large doses, however, increase powerfully the propulsive activity of the arterioles by exciting the sympathetic center, and simultaneously the adrenal center.* So far it acts much as does sodium salicylate. Quinine is endowed with an additional virtue, however: that of acting as a direct bactericidal agent, the pneumococcus offering but slight resistance to agents capable of acting as does quinine upon the plasmodium malariae.*

Quinine in large doses may thus be effective in pneumonia because it causes the arterioles to flood the diseased area with blood rich in auto-antitoxin and an additional and powerful germicide.* Creosote carbonate (*vide supra*) however, is safer.

* Author's conclusion.

⁶⁸ Talamon and Lecorché: "Thérapeutique Appliquée," Robin, 1896.

⁶⁹ DeBecker: Ann. de la Soc. de méd. d'Anvers, vol. ix, p. 65, 1893.

⁷⁰ Sebring: Medical Record, Apr. 22, 1899.

⁷¹ Sir Hermann Weber: Practitioner, Feb., 1900.

⁷² Pye-Smith: Medical Record, Apr. 21, 1900.

⁷³ F. D. Reese: Medical Record, Nov. 26, 1904.

Quinine has been used by a few European clinicians, some, Juergensen,⁷⁴ having given it in 5-gram (77 gr.) doses. Recently W. J. Galbraith, of Cananea, Mexico,⁷⁵ called attention to the great value of this mode of treatment, emphasizing, however, the need of very large doses—a view thoroughly sustained by the interpretation of its action I have submitted. His method is as follows: "First a warm bath, followed by a calomel or phosphate of soda purge. The first dose of quinine is given three hours later provided the stomach is not disturbed. If the temperature is 105° F. (40.5° C.) or over he gives from 60 to 70 grains (4 to 4.6 gm.) of quinine sulphate, followed in an hour by usually half the same dose. If the temperature ranges between 103° and 104° F. (39.5° and 40° C.), from 40 to 50 grains (2.6 to 3.3 gm.) are given as above. If a lower temperature is found, he gives 40 grains (2.6 gm.), his minimum initial dose. The use of the tincture of the chloride of iron is begun within three or four hours after the second dose of quinine, and in doses ranging from 10 to 15 minims (0.6 to 0.9 c.c.) at intervals of from two to six hours, depending on the condition of the pulse. In case the temperature rises to 101° or 102° F. (38.3° or 38.9° C.), after it has reached the normal or subnormal mark, he administers from 40 to 50 grains (2.6 to 3.3 gm.) of quinine at one dose and continues the iron in 15 minim (0.9 c.c.) doses every three or four hours. He protests against any compromise in the way of dividing the doses of either iron or quinine during the active pneumonic stage. If the stomach is rebellious it may usually be overcome by chlorotone or pepsin and guaiacol. He dresses his patients with as light-weight clothing as possible and provides thorough ventilation and advises plenty of liquid nourishment." A number of physicians, Drs. Gustetter, Carpenter, Haney, Butzow and Dudley, all of Cananea,—where the mortality of pneumonia is exceedingly high owing to the atmospheric conditions and the altitude,—have confirmed his observations in their own practices. From 75 per cent. in a very large number of cases, Galbraith's mortality, for example, dropped down to 2 per cent. Gustetter⁷⁶ of the Marine Hospital Service in the same region, reduced his average mortality, 80 per cent., to no death in the 30 cases with the same treatment.

S. Solis-Cohen⁷⁷ advocates the use of the soluble double hydrochloride of quinine and urea in 50 per cent. solution by intramuscular injection, with fresh air. When the blood-pressure is low, he adds injections of cocaine hydrochloride solution or an extract of posterior pituitary. In cases of prolonged fever and delayed convalescence, he also uses pneumococcus or mixed vaccines.

An important feature connected with the treatment of pneumonia is the preservation of the normal osmotic properties of the body fluids.* If the blood is abnormally viscid, as is the case when its alkalinity is low, its bacteriolytic and antitoxic properties are so hampered that the beneficial effects of the remedies are greatly compromised.*

AGENTS WHICH PRESERVE THE EFFICIENCY OF THE PROTECTIVE RESOURCES.—*Blood Salts*.—This object is met by supplying

* Author's conclusion.

⁷⁴ Juergensen: Ziemssen's "Cyclopædia," 1875; cited by von Mansfelde: Jour. Amer. Med. Assoc., Mar. 17, 1906.

⁷⁵ W. J. Galbraith: Jour. Amer. Med. Assoc., Feb. 10, 1906.

⁷⁶ Gustetter: *Ibid.*, Mar. 17, 1906.

⁷⁷ S. Solis-Cohen: New York Med. Journal, p. 299, Aug. 9, 1913.

to the blood the salts it requires in order to conserve its normal fluidity and its normal properties. By thus facilitating the circulation of blood in the tissues, including the lungs, the latter are not only supplied with the protective elements available to disintegrate the bacteria and their toxins, but the toxic and acid wastes are freely drained into the blood-stream and transformed into eliminable products.

The salts of the blood "have most important functions" recently wrote Howell,⁷⁹ "they maintain a normal composition and osmotic pressure in the liquids and tissues of the body." . . . "Moreover, these salts constitute an essential part of the composition of living matter." Jacques Loeb⁸⁰ also states that, "the sodium ions of the blood as well as of the sea-water, are essential for the maintenance of life-phenomena."

In the first volume I pointed out that in pneumonia a large amount of sodium chloride was consumed; that owing to restricted diet or anorexia, the patient received an inadequate supply, and that the vital and defensive functions being increasingly hampered, the chances of death were considerably increased.*

The reader is referred to the first volume⁸¹ for the experimental evidence contributed by Metchnikoff, Behring and Nissen, Paul, von Fodor, Blumenthal and many others in support of this conclusion. Barlow⁸² alluding to diminution of the blood's alkalinity during fever says: "The cause of this change is quite unknown . . . but whatever the true explanation may be, it is probable that the change is highly important for the organism, for it is an unfavorable sign in febrile disease, and it is known that diminished alkalinity of the blood goes hand in hand with increased susceptibility to infection."

In pneumonia the chlorides are soon diminished in the urine, then disappear entirely. Inasmuch as even moribund cases are sometimes saved by saline solution hypodermoclysis, the need of sodium chloride is self-evident, and if introduced into the blood *from the outset* of the fever as suggested by myself⁸³ and not late in the disease as now practiced, the blood's protective functions and its osmotic properties may be adequately sustained throughout the disease.

Beale many years ago showed that the chlorides disappear from the urine to accumulate in the lungs. Huchard also emphasized the importance of this symptom. Hutchison⁸⁴ found, on the other hand, that

* Author's conclusion.

⁷⁹ Howell: "T. B. of Physiol.," p. 801, 1905.

⁸⁰ Jacques Loeb: "Studies in General Physiology," part ii, p. 556, University of Chicago, 1905.

⁸¹ Cf. vol. i, pp. 778 et seq.

⁸² Barlow: "General Pathology," second edition, p. 415, 1904.

⁸³ Cf. vol. i, p. 784, in the first two editions.

⁸⁴ Hutchinson: Jour. of Path. and Bact., vol. v, p. 406, 1898.

the chlorides were taken up by all fixed tissues. Roehrich and Wiki⁸⁵ observed that when the crisis occurs and a rapid favorable change takes place, the chlorides suddenly become very abundant; but if defervescence is by lysis the increase is proportionately gradual, the normal proportion being reached in three or four days. Failure to rapidly increase is an unfavorable sign. Henry, who first used hypodermoclysis in "desperately ill" cases⁸⁶ nevertheless saved eight out of ten of these cases. As similar results have been obtained by others when all other means had failed, the physiological aid given by the salt is unquestionable. Yet, being recommended in text-books only for desperate cases, it is now rarely employed. Ewart and Percival⁸⁷ for instance state that saline injections "were powerless to check the fatal course" in "the worst type of cases." How can it be otherwise when the whole body is overwhelmed with toxins?

Hypodermoclysis and intravenous injections of saline solution involving the frequent use of a large hypodermic needle, thus giving pain and exposing the patient to abscesses, are not appropriate for repeated use. The *oral* use of saline solution in the manner and under the conditions indicated on page 1367 meets all therapeutic indications. Hypodermoclysis may be substituted when, in advanced cases, an immediate effect is required.

The oral use of saline solutions was introduced by J. B. Todd, of Syracuse, N. Y.⁸⁸ Inspired by my views, he employed it *early* in all his cases, with prompt and satisfactory results. For an adult he gives 10 grains (0.6 gm.) of sodium chloride and 5 grains (0.3 gm.) of potassium bicarbonate, dissolved in 8 ounces (250 gm.) of water. A teaspoonful of lemon juice added to this mixture thus transforms it into an effervescent beverage which is gratefully taken by the patient. This quantity may be given to febrile cases every two hours. The potassium bicarbonate antagonizes acidosis. J. Madison Taylor⁸⁹ obtained similar effects in the pneumonia of children. This corresponds with the results reached by predecessors who, though unaware of the influence of salt solution on the immunizing processes, employed injections early. Thus in all cases in children reported by Lemaire,⁹⁰ he found that "the blood-pressure was promptly raised, diuresis was increased, the whole organism, notably the nervous system, was powerfully stimulated, oxidation was enhanced, and all recovered." F. W. D'Evelyn,⁹¹ H. F. Thompson⁹² and others have also extolled the value of this measure in severe cases.

AGENTS WHICH COUNTERACT ASTHENIA. — We have seen that cases in which leucocytosis fails to occur, either through general adynamia, alcoholism, or when, owing to a profound toxæmia, the toxins have caused adrenal insufficiency, the chances

⁸⁵ Roehrich and Wiki: Revue médicale, June 20, 1900.

⁸⁶ Henry: Intern. Clinics, vol. iv, ninth series, p. 29, 1900.

⁸⁷ Ewart and Percival: Brit. Med. Jour., Sept. 29, 1900.

⁸⁸ J. B. Todd: N. Y. Med. Jour., May 20, 1905.

⁸⁹ J. Madison Taylor: N. Y. Med. Jour., Dec. 30, 1905; Medical Record, Jan. 13, 1906.

⁹⁰ Lemaire: Semaine médicale, vol. xviii, p. 405, 1898.

⁹¹ F. W. D'Evelyn: Medical Record, Dec. 30, 1905.

⁹² H. F. Thompson: Medical News, Apr. 25, 1903.

of recovery are greatly reduced.* A deficiency of adrenoxidase being the direct cause of the adynamia, agents capable of increasing the functional activity of the adrenals are indicated.*

Digitalis.—In asthenic cases of any kind and when hypoleucocytosis is present, digitalis should be used besides the alkaline beverage and the creosote carbonate or quinine. This agent satisfies several requirements: By powerfully stimulating the adrenals it strengthens the action of the heart and the proportion of auto-antitoxin in the blood.* As in asthenic cases, there is relaxation of the arteries, full therapeutic doses of digitalis—8 to 12 minims (0.5 to 0.8 gm.) of the tincture, or digitalin, $\frac{1}{10}$ to $\frac{1}{8}$ grain (0.0065 to 0.01 gm.), are required three times daily to obtain adequate effects.

That digitalis provokes leucocytosis was shown by Naegeli-Akerblom⁹³ and Borini.⁹⁴ Von Jaksch⁹⁵ long ago emphasized the need of such an agent in pneumonia. Its action on the heart is familiar to everyone. All these properties plainly account for the remarkable results obtained by many clinicians since Traube in 1850 first suggested its use, and especially since Petrescu⁹⁶ obtained a mortality of 1.2 to 2.6 per cent. in 1192 soldiers. This was ascribed to the youth and vigor of these men, but as shown by Lépine, Mosius, Finkel, Landouzy and others, this reason is not valid. All clinicians agree, however, that in order to obtain beneficial effects, large doses are necessary. Franc⁹⁷ refers to equally good results obtained with digitaline. Beates⁹⁸ and Arnold and H. C. Wood, Jr.,⁹⁹ have shown that the doses usually prescribed are practically useless.

To obtain a prompt reaction in asthenic cases, *adrenalin* has been found of value, especially where other stimulants fail. Its action differs from that of digitalis in being ephemeral instead of lasting. This is because digitalis stimulates the adrenal center and sustains the physiological production of the adrenal secretion, while conversely, adrenalin only adds a small fraction to the total amount already in the blood.* Adrenalin may be given in doses of 15 minims (1 gm.) of a 1 to 1000 solution, at short intervals according to the needs of the case. *Adrenal extract*, 3 grains (0.2 gm.), every two or three hours, has been found valuable as a general stimulant. This shows that *thyroid extract* in small doses, 3 grains (0.2 gm.) every three hours, would also prove efficacious.

* Author's conclusion.

⁹³ Naegeli-Akerblom: Central. f. inn. Med., Bd. xvi, S. 769, 1895.

⁹⁴ Borini: Central. f. Bakt. u. Par., Bd. xxxii, S. 207, 1902.

⁹⁵ Von Jaksch: Central. f. klin. Med., Feb. 6, 1892.

⁹⁶ Petrescu: Le bull. médical, vol. viii, p. 337, 1894.

⁹⁷ Franc: *Ibid.*, vol. ix, p. 885, 1895.

⁹⁸ Beates: Jour. Amer. Med. Assoc., June 26, 1897.

⁹⁹ Arnold and H. C. Wood, Jr.: Amer. Jour. Med. Sci., Aug., 1900.

E. A. Gray¹⁰⁰ used suprarenal extract in the above doses in six cases. The stimulation was marked; the heart reacted promptly and the general symptoms were favorably influenced, especially in aged subjects. H. L. Elsner¹⁰¹ used adrenalin with advantage in several cases. In one of these its use, after strychnine had failed, promptly increased the cardiac power and the blood-pressure. S. Solis-Cohen¹⁰² prefers suprarenalin triturate given every ten minutes with a little sugar of milk.

Other drugs have proven useful in this connection, namely, *strychnine*, *pilocarpine*, *alcohol*, *strophanthus*, *atropine*, *caffeine*, *ammonium carbonate*, and *nitroglycerin* given in the usual therapeutic doses.

AGENTS WHICH COUNTERACT EXCESSIVE ARTERIAL TENSION AND PULMONARY ENGORGEMENT.—When the disease occurs in strong plethoric individuals, the protective reaction is so violent sometimes that the lungs become excessively congested through undue arterial tension and the heart becomes overburdened. Marked dyspnea and even cyanosis may then occur—conditions which some clinicians meet by bleeding. This measure reduces the congestion, but, of course, at the expense of the blood's protective constituents. Viewed in this light, bleeding is an unscientific measure and is not recommended, especially since we have remedies capable of relieving the patient without compromising his prospects of recovery.

Veratrum viride, by depressing the activity of the vasomotor center, correspondingly diminishes the pulmonary engorgement since its main cause, excessive blood-pressure, is diminished through the resulting dilation of the great central trunks. The dangerous resistance to which the heart is subjected is also removed because the "patient is bled into his own circulation," as Wood says. The temperature is likewise lowered and perspiration is provoked. The tincture of *veratrum viride* may be used, 8 to 16 minims (0.5 to 1.0 gm.) (1905 U. S. P.) being given every two hours until the desired effect is produced. It is only indicated, however, in sthenic cases. In such, *veratrum viride* assists the curative process since it causes relaxation of the arterioles, thus admitting more blood—which is always rich in auto-antitoxin in sthenic cases—into the diseased area.*

* Author's conclusion.

¹⁰⁰ E. A. Gray: Medical Record, Apr. 5, 1902.

¹⁰¹ H. L. Elsner: N. Y. Med. Jour., Jan. 2, 1904.

¹⁰² S. Solis-Cohen: Jour. Amer. Med. Assoc., Dec. 10, 1904.

H. C. Wood¹⁰³ states that although *veratrum viride* can produce alarming symptoms, it is the safest of cardiac depressants. Dickerson,¹⁰⁴ Rittenhouse,¹⁰⁵ Atkinson,¹⁰⁶ Hill,¹⁰⁷ Stephens,¹⁰⁸ and others praise it highly, the last named after using it in 54 cases. Illoyay¹⁰⁹ also found it valuable in children in doses varying from $\frac{1}{2}$ to $\frac{1}{4}$ drop (2 to 4 drops, 1905 U. S. P.) given every hour and a half.

I have obtained effects similar to those of *veratrum viride* by means of full doses of *sodium bromide*, *i.e.*, 20 to 30 grains (1.3 to 2 gm.) every three hours, giving it only until the dyspnoea was relieved. The cough and pain are also favorably influenced. Its action is similar to that of *veratrum viride*: by causing general vasodilation it depletes the congested areas.* It is especially useful when there is delirium.

When an immediate effect is required, *i.e.*, when there is great dyspnoea or cyanosis, *nitrite of amyl* inhalations, which cause general vasodilation, are indicated, the effect being sustained with *nitroglycerin* given internally.

The indiscriminate use of the latter drug, especially in sthenic cases, is a dangerous practice. As Hare states, "it has come to be employed with the idea that it is a circulatory stimulant, which is an entirely erroneous conception."

The management of a case of pneumonia, in the light of my views, reduces itself as regards remedies to the following general principles: (1) *creosote carbonate* in any kind of case, sthenic or asthenic, or *sodium salicylate* if *creosote carbonate* is not available; (2) *quinine* in asthenic cases, including alcoholics, the ill-fed, overworked and obese subjects; (3) *digitalis* or *thyroid gland*, or in emergencies *adrenalin*, when the protective reaction of the adrenal system is deficient; (4) *veratrum viride* or the *bromides* when the vascular tension is excessive in sthenic subjects as shown by dyspnoea, duskiness or cyanosis; (5) *amyl nitrite* and *nitroglycerin* when these symptoms become threatening; (6) *saline beverages* in all cases attended by fever.*

* Author's conclusion.

¹⁰³ H. C. Wood: "Therapeutics," eleventh edition, 1900.

¹⁰⁴ Dickerson: Jour. Amer. Med. Assoc., Nov. 9, 1901.

¹⁰⁵ Rittenhouse: Clinical Review, Feb., 1905.

¹⁰⁶ Atkinson: St. Louis Med. Rev., May 18, 1901.

¹⁰⁷ Hill: N. C. Med. Jour., June 5, 1898.

¹⁰⁸ Stephens: Therap. Gaz., Nov. 15, 1901.

¹⁰⁹ Illoyay: Pediatrics, Dec. 15, 1900.

BRONCHO-PNEUMONIA.

SYNONYMS.—*Capillary Bronchitis; Catarrhal Pneumonia; Lobular Pneumonia; Aspiration Pneumonia; Deglutition Pneumonia; Suffocative Catarrh.*

Definition.—Broncho-pneumonia, an inflammation of the bronchioles, lobules and often of the parenchyma of a circumscribed portion of both lungs, is due to the multiplication therein of pathogenic organisms, particularly of the pneumococcus, streptococcus pyogenes and staphylococcus pyogenes, owing to a deficiency in the mucus and mucosa of the respiratory tract, of auto-antitoxin and phagocytes, which, under normal conditions, destroy these germs and their toxins. The deficiency of these protective agents may be due either to local or general adynamia: local, as after anaesthesia, tracheotomy, prolonged inhalation of granite dust, etc.; general, as after debilitating diseases, or owing to marasmus, rickets, senility, etc., the primary cause of which, in the latter case, is hypoactivity of the adrenal system.*

Symptoms.—The development of broncho-pneumonia varies to a certain extent with the cause, but as a rule the onset is not sudden, as in pneumonia, because the initial phenomena are bronchial. These consist of a stubborn cough, a moderate rise of the temperature and pulse, vomiting and sometimes convulsions. If it develops as a complication, the primary disease changes its aspect; eruptions such as those of measles or scarlatina become less defined or disappear; the cough of pertussis loses its characteristic sound, etc.

When the pneumonic inflammatory process develops, the temperature, from perhaps 100° F. (37.8° C.) that it was before, now rises—unless the original disease be a debilitating one—to 102° F. (38.9° C.) and above—as high as 104.5° F. (40.3° C.); the pulse becomes rapid: from 120 to 150; repeated slight chills occur, and the cough becomes more severe and harassing. The febrile process is extremely irregular, both it and the pulse, which is, as a rule, feeble and frequent, varying with the intensity of the pulmonary lesions and the fluctuations of the

* Author's definition.

arterial tension. As a rule, however, the temperature gradually rises during two or three days, remains at the highest point one or two days or more. Then occurs a remission, followed in turn by a new exacerbation, etc. The breathing becomes rapid, and the child soon shows evidences of distressing dyspnoea, until finally the lips and face become cyanosed. This may be followed by a leaden hue or lividity with dilation of the pupils—signs of impending dissolution.

The child may pass away at this time, but often the accumulation of carbon dioxide in the blood dulls sensibility; the irritable cough improves and though the lividity of the face continues and the respiratory rate is very high, and the pulse suggests by its rapidity, weakness and irregularity a lethal trend, a change for the better occurs and the child is soon restored to health.

The physical signs are mainly those of bronchitis; fine sibilant and mucous râles or sonorous ronchi are heard on both sides, the percussion note being but slightly modified from the normal, though a slight increase in resonance is sometimes obtained. When the base of both lungs is involved, dullness over the diseased area, with some bronchophony and fine subcrepitant râles suggests consolidation; but if these signs are fugacious, disappearing at one time to re-appear at another, they indicate temporary exacerbations of local congestion which cease as soon as convalescence begins.

In *aged subjects* the occurrence of broncho-pneumonia is very probable when dyspnoea suddenly occurs in the course of a bronchial catarrh, the respirations rising from 26 to perhaps 40. Adynamia, dryness of the tongue and a high fever, delirium, etc., then follow in rapid succession, the typical physical signs of broncho-pneumonia soon becoming evident. Cyanosis is a more serious symptom than in children in these cases, owing to the lack of recuperative vitality which senility entails. Hence the great fatality of the disease in such subjects.

In *adults* especially in sthenic subjects, the dyspnoea is apt to become severe very early, the fever soon rising to 104° F. (40° C.). The expectoration is free and often tinged with blood, and a red spot on both cheeks attests to the kinship of the condition present to lobar pneumonia, with the physical

signs of an intense bilateral bronchitis, and in many instances the general phenomena of a general typhoid state.

In *infants* the disease occurs most frequently during the first six weeks of life. The infant refuses the breast and soon shows respiratory distress, some fever or perhaps hypothermia. In some instances convulsions occur among the earliest signs of the disease, and are soon followed by its typical phenomena. It is very frequently fatal, corresponding in this particular with the broncho-pneumonia of the aged. The mortality is especially great among bottle-fed children.

Hardy¹¹⁰ in a study of 150 fatal cases found that the mortality was 7.7 times as great in bottle-fed as in breast-fed children. This is readily accounted for in the light of my views by the fact that the maternal milk supplies the infant with auto-antitoxin which protects it against infection. Even fresh cow's milk fails to do this, since the reactions to which the auto-antitoxin is submitted within a few minutes after it is drawn, deprive it of its bacteriolytic and antitoxic properties. The question is a complex one which I will treat elsewhere at length.

Etiology and Pathogenesis.—Broncho-pneumonia, as its name implies, is a combination of bronchitis and pneumonia, and occurs mainly in children before the third year and in aged subjects. It is occasionally observed in the adult. In children it may develop idiopathically, *i.e.*, from a cold, beginning often with coryza or laryngitis, or both, especially when the subjects are debilitated, anæmic, poorly fed, etc. In about two-thirds of the cases, however, it occurs as a complication of measles, scarlet fever, pertussis, diphtheria, erysipelas, infantile diarrhoea and variola, often owing to exposure to draughts, inadequate covering, etc., during convalescence, while the child is still weak. We thus have precisely, as in pneumonia, a debilitated body as soil for the development of the pathogenic organisms.

The primary form is due to the pneumococcus, while the secondary form is ascribed to the streptococcus mainly, but also to other bacteria: the pneumococcus of Friedländer, the bacillus of influenza, of typhoid fever, of tuberculosis, the bacillus coli communis, etc. Most of these are derived from the upper respiratory tract and the mouth. Broncho-pneumonia may also be caused by the inhalation of stone, steel, coal and other dusts, and by the aspiration of particles of food or, in the newborn, of lochial discharges.

¹¹⁰ Hardy: Lancet, Sept. 24, 1904.