

lished. The therapeutic endeavor is then to control the cough, overcome the fetor of the sputum, and keep up the general tone of the individual. The patients must avoid exposure to cold and wet. They must spend their winters, at least, in the South, and are better for living the year around in a dry, warm, equable climate. Moderate daily outdoor exercise and the best of food are very important.

DIAGNOSIS.—In aiming at a diagnosis of chronic pneumonia, we have to consider the possibility of pleurisy, cancer of the lung, pneumothorax, and pulmonary tuberculosis.

PROGNOSIS.—The outlook for the future comfort and happiness of these patients depends largely upon their dispositions and their ability to get to a suitable climate. No hope of cure can be held out to them. The disease, however, is seldom in itself a cause of death. Some intercurrent malady usually terminates the scene.

Henry E. Hale.

PNEUMONIA, LOBAR.—(Synonyms: Croupous Pneumonia, Fibrinous Pneumonia, Pneumonitis, Lung Fever.) The lung differs from all other structures in having two separate circulations—the nutrient, supplied from the left side of the heart through the bronchial arteries, and the functional, supplied from the right side of the heart through the pulmonary artery. This double circulation underlies all the phenomena of pneumonia, and must be recognized in any definition of the disease, as without it the disease itself could not exist.

DEFINITION.—Lobar pneumonia is an acute disease in which a specific parasite invades the air cells of one or more pulmonary lobes, where it grows in a fibrinous medium exuded from the functional capillaries, and generates a toxin that infects the system at large.

The local process causes consolidation of the affected area by filling the air cells with the effused material, which material is afterward removed, leaving the structure of the lung intact. The general infection is marked by fever, which in a typical case begins with a chill, and after a duration of from four to nine days ends abruptly by crisis.

In most cases a local dry pleurisy is excited, the phenomena of which are added to those of the pneumonia proper.

Death may take place from the virulence of the infection, from loss of respiratory surface, from exhaustion of the right heart, from consecutive asthenia, or from a combination of two or more of these causes.

SYMPTOMS AND CLINICAL COURSE.—The attack may be preceded by prodromes, such as malaise, headache, anorexia, pain in the limbs and back, etc.² But, as a rule, the first complaint of the patient is of pain in the chest, usually in the mammary region. This is sudden in its onset and often very severe, and by restricting the movements of the ribs renders the respiration superficial and rapid. In most cases a chill follows, or, it may be, precedes the pain. The chill varies from a mere creeping sensation to a heavy and prolonged rigor, as severe as in a case of intermittent fever. With the chill there is a rise of temperature. The thermometer shows from 3° to 4° F. of fever during the first twelve hours, rapidly rising until the temperature reaches from 103° to 105° F. or even more. Then there is a period during which the temperature is maintained with slight variations until from the fifth to the eighth day, when a crisis occurs and the temperature becomes normal, or often subnormal. Cough is an early symptom, but it is repressed as much as possible to avoid the severe pain which it causes. The expectoration is apt to be frothy at first and mixed with florid blood; later it becomes viscid and very tenacious, so that it is spat out with difficulty and adheres like thick mucilage to the vessel containing it. Its color at this stage varies in different cases. It may be a light yellow, a pale green, or a chocolate-brown, or a mixture of these colors. It is often likened to prune juice. Sputa of this kind may be considered pathognomonic. As resolution progresses the expectoration becomes less

colored, less sticky in consistence, and more catarrhal or purulent in its character, and the quantity gradually diminishes until it ceases altogether.

The respirations are early increased in frequency, and this quite out of proportion to the pulse rate and temperature. In nearly every severe case the respirations will go up to 40 or 50 or more to the minute, and they not infrequently reach 60 or more when the consolidation is extensive, or pulmonary edema takes place. This disproportionate frequency of respiration is very significant. The pulse is full and strong in the early stages, running from 90 to 100 when the temperature is 103° to 104° F., and becoming weaker and more frequent as the disease advances. When the respiration is greatly embarrassed the pulse is apt to be small and creeping.

The skin is hot and dry at first, later there is a tendency to perspiration, which may be profuse. The face is pale, with often a dusky red patch on each cheek. The lips are inclined to a bluish hue in proportion to the degree of pulmonary implication. They are often the seat of an herpetic eruption.

After the first forty-eight hours the chlorides in the urine are greatly diminished, or entirely absent. In severe cases a moderate degree of albuminuria is common during the height of the disease.

The physical signs begin to be appreciable, as a rule, within from twelve to twenty-four hours after the initial chill. Usually the first to be noticed is a fine crepitan rale, heard only with inspiration, though in some cases this is preceded by a diminished clearness of the respiratory murmur. Dulness on percussion succeeds, increasing in intensity as the consolidation becomes more complete. Ultimately the respiratory murmur is wholly replaced by a peculiar whiffing sound heard most distinctly toward the close of expiration, the so-called tubular breathing. If the pleura is involved there may be a rubbing or creaking sound in addition. There are increased vocal resonance and vocal fremitus. At the crisis, while the temperature falls and the pulse and respiration become less frequent, there is no immediate change in the physical signs, showing that the condition of the affected area remains the same.

In a large proportion of cases of pneumonia there is decided leucocytosis, the white cells numbering 20,000, 30,000, 40,000 or more to the cubic millimetre.

Variations from the above course are common. The pain may be entirely absent, or it may be felt at a point outside the chest, as for instance in the abdomen. The chill is absent in about one-third of all cases. The subsequent severity of the attack seems to be in some degree proportioned to that of the chill, but this rule has many exceptions, especially in advanced age. The temperature begins to rise from the moment of the attack, and increases with slight fluctuations until the maximum is reached. In cases that pass the crisis the highest point is usually a few hours before the decided fall takes place. When death takes place before the crisis, the highest point often immediately precedes dissolution, when it may reach 107°, 108°, or even 109° F.

When defervescence occurs by crisis, which is usually from the fifth to the eighth day, the temperature falls within a few hours almost or quite to normal. This is apt to occur during the night, and it often happens that the patient is left at the evening visit with no sign of an approaching decline of temperature, yet the next morning is found in an almost afebrile condition.

Within a day or two after the crisis the temperature very often becomes subnormal.

In a considerable proportion of cases instead of crisis there is a gradual fall of temperature until the normal line is reached. This defervescence by lysis may be complete at any time between the third and the fifteenth or twentieth day.

Delirium.—As the pyrexia increases, delirium is pretty frequently observed. Occurring early, and in persons having a tendency to cerebral disturbance in the presence of fever, it may have but little significance, but in other cases it is due directly to the infection, and it then points

to a condition of considerable gravity. Old persons are especially liable to a quiet delirium resembling that of typhoid fever.

Sleeplessness is not at all uncommon, and should always suggest an inquiry into the habits of the patient.

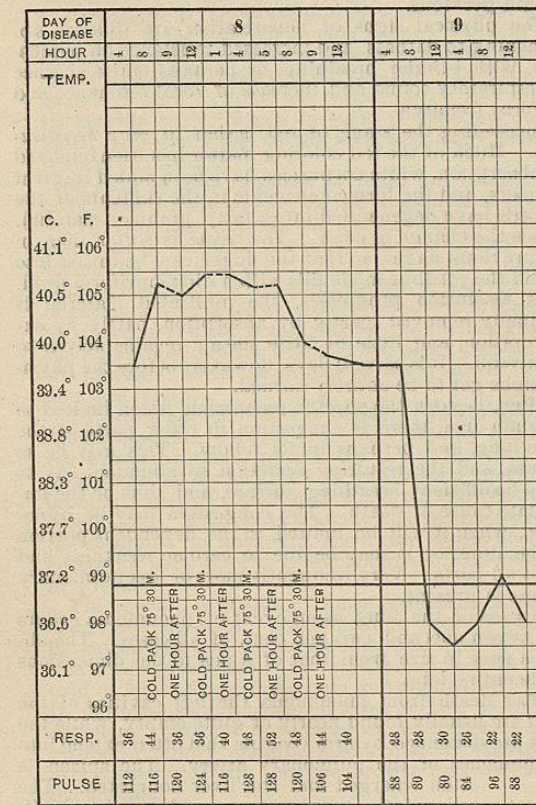


Fig. 3829.—Defervescence by Crisis.

for while it is not confined to those with alcoholic antecedents, it is much more frequent in such persons, and in the absence of delirium the key to the problem might be overlooked. In non-alcoholics the condition seems to be one of cerebral irritation at first, and later, perhaps, of cerebral exhaustion.

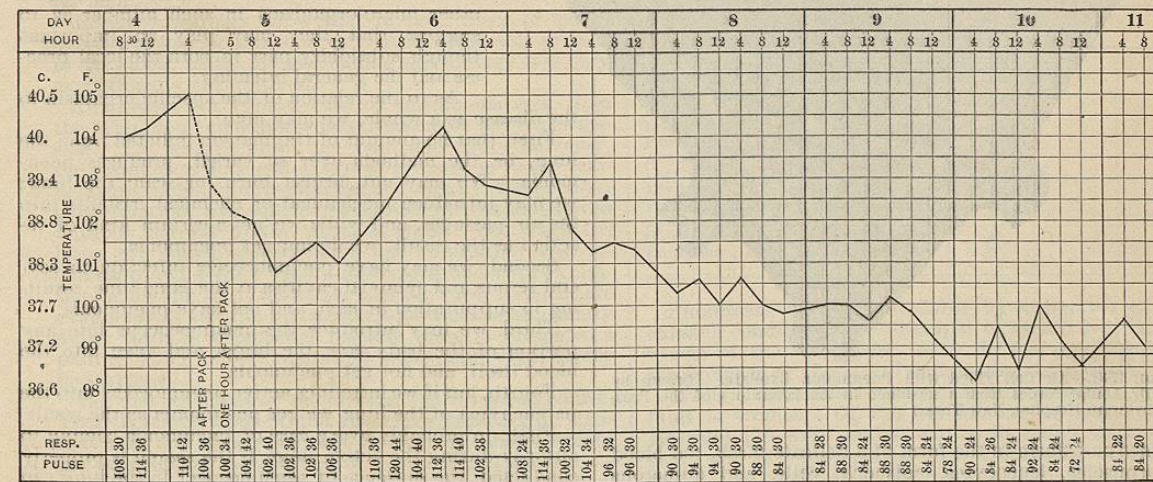


Fig. 3830.—Defervescence by Lysis.

In children often, and very rarely in adults, convulsions take the place of the initial chill.

Causes of Death.—Death may occur in a variety of ways. The patient may be overwhelmed by the intense virulence of the infection, death occurring within from thirty-six to forty-eight hours after the chill. Apparently all the vital functions are overpowered by the toxæmia. There is extreme muscular and nervous prostration, the heart's action becomes rapid and feeble, digestion is suspended, the kidneys act imperfectly, delirium and coma supervene, and death occurs from acute asthenia.

In other cases death is caused by exhaustion of the right heart. The muscle, already enfeebled by the action of the poison, tires out from overwork, dilatation and over-distention follow, and finally, failure to contract.

Still another cause of death is loss of respiratory surface. This is rarely the result of simple pneumonic consolidation, but there are added to this, congestion and edema of other portions of the lung. The lung fills up more and more, and death by asphyxia takes place.

Not infrequently death comes from exhaustion of the vital powers after a protracted struggle which the system is no longer able to endure. This is common in feeble and aged persons, and occurs usually after the febrile period.

Lastly, death may be caused by one or more of the complications of the disease.

In addition to the foregoing, sudden death may occur at any stage of the disease in a manner which, with our present knowledge, cannot be accounted for, and for which there is no anatomical explanation.

PATHOLOGY.—Autopsical Findings.—These correspond to a process extending from simple hyperæmia through extreme engorgement, fibrinous and cellular exudation into the air cells, complete consolidation, fatty degeneration of the exudate, and removal of the latter by absorption and expectoration. All of these stages may be represented at the same time in different portions of the lung.

The earliest lesion is simple congestion. When the chest is opened a portion of the lung may be found in this condition. It is not so fully collapsed as the surrounding normal lung, and to the touch it is slightly more resistant. On section the surfaces are bright red, and exude a bloody frothy serum. The physical sign corresponding to this condition is a slight localized feebleness of respiration, with more or less abundant moist râles. A few hours later the hyperæmia has passed into an extreme degree of vascular engorgement. The diseased part shrinks but little when the chest is opened. The pleural surface is of a deep red color, veiled by more or less of fibrinous exudate, which peels off readily in flakes. The resistance to touch is markedly increased,

and on section the tissue is more readily divided than in healthy lung. The cut surfaces are dark red, and dark blood mingled with air follows the knife. The appearance resembles closely that of an incised spleen, and the term splenization is applied to this stage of the local disease. Microscopically, the pulmonary capillaries are found distended with blood, more or less fluid occupying the air cells. But the lung still crepitates between the thumb and finger, and can be squeezed dry without breaking down. A piece of it thrown into water floats.

The corresponding physical signs are diminished resonance on percussion, broncho-vesicular respiration, crepitation râles, and slightly increased vocal resonance. A pleural friction sound also is often present.

In the next stage the air cells are filled with a fibrinous exudate, by which the parenchyma is completely solidified. If a considerable area is involved, the lung is increased in volume, and pushes out into the intercostal spaces, so that furrows are imprinted on its surface by the ribs. The lung is usually covered by a dense layer of fibrin, which, if removed, shows a deep mottled red or purple color beneath. This layer is adherent to the costal pleura also, and the separation leaves both surfaces rough and irregular. When cut into, the solidified mass has much the consistency of liver, and is dark red or brownish-red in color, and for this reason the condition is known as *red hepatization*. A piece of lung in this condition will sink in water. The infiltrated tissue does not crepitate on pressure, is friable, and can be torn much more readily than normal lung structure. During this stage the weight of the lung may reach 2,500 or 3,000 gm., instead of 600 gm. which is the normal average.

Microscopically the contents of the alveoli consist

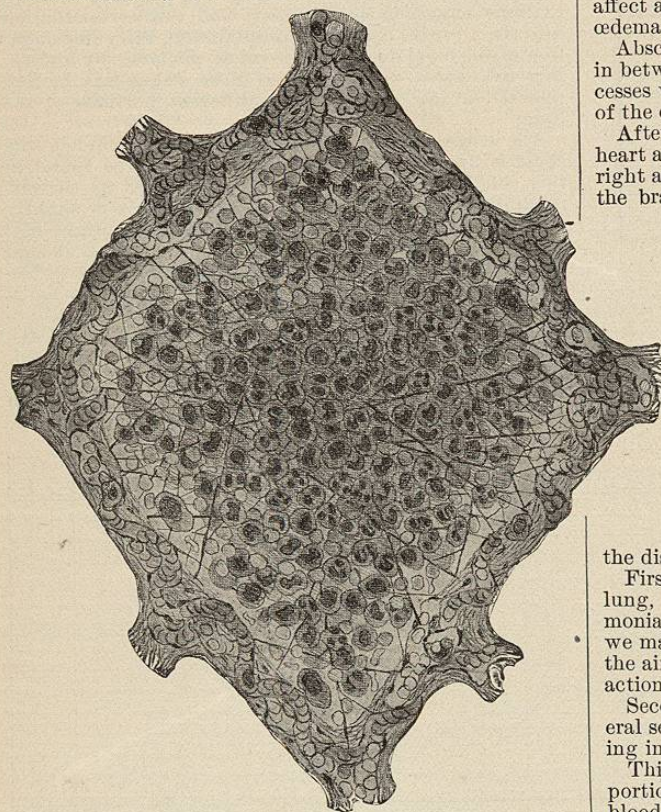


FIG. 3831.—Air Cell Filled with Pneumonic Exudate. (Drawn by Dr. Louise Cordes from a specimen in the laboratory of the Presbyterian Hospital, New York.)

chiefly of fibrin in the form of a delicate mesh, red blood corpuscles, leucocytes, epithelial cells, and numerous diplococci pneumoniæ. Other organisms, such as strep-

tococci, staphylococci, etc., are often found associated with the specific microbe.

In this stage the capillaries derived from the pulmonary artery are occluded, and the resulting thrombosis extends back into the larger vessels. The septa between the air cells are but little changed. The nutrient vessels remain pervious.

The physical signs of hepatization are dulness approaching to flatness, and increased resistance on percussion, with tubular breathing, or perhaps entire absence of respiratory sound and increase of vocal resonance and of vocal fremitus.

Succeeding the stage of red is that of *gray hepatization*. Much of the red coloring matter has been removed by absorption, white corpuscles have been added in great numbers, and the formed elements in the contents of the air cells have degenerated into a fatty, granular material. Hence the change in color. The tissue is softer than in the previous stages, so that the finger can be thrust into it, and the pit thus made fills with a dirty puriform fluid.

As resolution progresses, the infiltrated material is gradually removed, partly by absorption, partly by expectoration, and little by little the air regains access to the alveoli. It is several days, however, before the physical signs get to be entirely normal.

Often, besides the specific pneumonic lesion limited to a certain area, there is congestion in other parts of the same lung, and perhaps in its fellow. This may be so intense, and the resulting secretion so abundant, as to leave insufficient breathing surface, and thus be the immediate cause of death. The congestion may be hypostatic, when it will be limited to the dependent portion of the lung, or it may be due to cardiac weakness and affect all parts. Very frequently more or less pulmonary œdema is present.

Abscess of the lung as an event of pneumonia occurs in between one and two per cent. of all cases. The abscesses vary in size from that of a pea to the dimensions of the entire lobe.

After death from pneumonia the left cavities of the heart are usually found nearly or quite empty, while the right are distended by firm coagula that often extend into the branches of the pulmonary artery. The spleen is often enlarged and the liver congested. The cells of the renal tubes may be in the condition of cloudy swelling, and in a small proportion of cases there is fully developed "nephritis."

PATHOLOGY.—It is now very generally conceded that the essential phenomena of pneumonia are due to the action of one or more forms of bacilli. In nearly every case the diplococcus of Fränkel is found in the exudate. With this are sometimes associated other micro-organisms in such number as to suggest that they may play an important though subsidiary part in both the local process and the general infection.

As to the relation of the specific organism to the disease as a whole, we may note:

First, that no amount of traumatism inflicted upon the lung, be the methods ever so varied, produces pneumonia. We may cut, bruise, burn, or scald the lung; we may introduce mechanical or chemical irritants into the air passages, and while we get a certain kind of reaction as the result, we do not get pneumonia.

Second, we may have pneumococcic infection in several serous and synovial cavities at the same time, resulting in suppuration in each, and not have pneumonia.

Third, we may introduce the pneumococcus into any portion of the body save the lungs, and even into the blood itself, and not get pneumonia.

Fourth, but if we introduce active pneumococci into the parenchyma of the lung we get pneumonia as the result.

Fifth, in probably every case of pneumonia coming to autopsy during the active stage, if the search is properly conducted, the presence of pneumococci in the lung can be demonstrated.

The inference from these facts is that the one thing necessary for the development of pneumonia is the presence in the alveoli of pneumococci in a condition of active multiplication.

It is known that pneumococci exist in the upper air passages of a considerable proportion of persons in absolute health. It is necessary only that favoring conditions should result in the translation of some of these into the alveoli in order that pneumonia occur. Once in the air cell the specific organism produces its specific irritation, causing effusion of the specific exudate. In this exudate as in a culture medium the coccus grows and separates its specific toxin, which in turn is absorbed into the blood, and gives rise to the fever and other manifestations of toxæmia.

So long as fresh supplies of toxin are being formed, or in other words, so long as the consolidation is spreading, so long the toxæmia will be maintained. But here again, as in artificial cultures, there is a limit beyond which the process cannot extend. A given quantity of culture medium can maintain the life of a given number of germs only for a certain time, beyond which the changes produced in it unfit it as a soil for the further growth of the organisms, and the death of the latter puts an end to the process. With the supply of toxin cut off, the temperature falls.

This does not exclude the theory of an antitoxin. Indeed, numerous observations, and especially those of the Klemperer brothers, go to show that a transient immunity is created by an attack of pneumonia, and that this immunity may be transferred to another subject by serum inoculation. This could scarcely be explained except on the theory of an antitoxin, and I can see no obstacle to accepting both theories in explanation of the phenomena in question.

The specific organism of lobar pneumonia is the *pneumococcus lanceolatus*. Discovered in 1880 by Sternberg, its causal relation to pneumonia was demonstrated by him a few years later. It is generally seen in pairs of oval or lancet-shaped elements surrounded by a capsule. In cultures, short chains of three or four members are common. Like other micrococci, it is non-motile. It grows in faintly alkaline media, and by transplanting every third or fourth day the growth may be continued indefinitely.

This organism is found, in all but a very small percentage of cases, in the expectorated material. Failure to find it is probably due to defective technique. When a pure culture is injected into the substance of the lung typical croupous pneumonia results.

When in a dry state the pneumococcus retains its virulence for long periods, especially when protected by being mixed with dried sputum. The disease has been communicated to newcomers in houses that had been closed for months.

Recent researches show that in fatal cases of pneumonia the specific diplococcus is quite commonly present in the blood, while in cases ending in recovery it is only exceptionally encountered.

DIAGNOSIS.—A typical case of pneumonia seen from the beginning can scarcely be mistaken for any other disease. The abrupt onset, the pain, the chill, the fever, the respiration accelerated out of proportion to the temperature, pulse, and respiration, and, finally, the peculiar expectoration, will suffice to establish the diagnosis even without the aid of the physical signs. But when the latter are added, and we have fine crepitation with inspiration and a little later a blowing sound with expiration, while the vocal resonance and the vocal fremitus are exaggerated, and the percussion note becomes constantly duller until it approaches flatness, there is presented a picture which for vividness and individuality can hardly be surpassed.

But not all cases of pneumonia run a typical course. There is scarcely one of the classical symptoms or signs that may not sometimes be wanting. In about twenty per cent. of all cases the chill is absent. Pain is not a marked feature unless the pleura is involved, and in cen-

tral pneumonia it is often not severe enough to excite complaint. In feeble or elderly persons the fever may be slight; indeed, even apart from these conditions, some of the worst cases that we meet show but a moderate temperature throughout. The pulse may not correspond with the temperature; and the respiration, usually the most characteristic of the symptoms, is sometimes not strikingly frequent. Cough and expectoration may be entirely absent, or the cough may bring up only a little frothy mucus from the bronchial tubes.

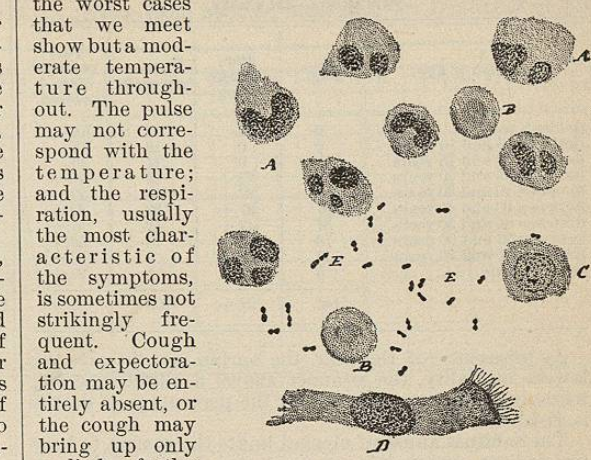


FIG. 3832.—The Micrococcus Lanceolatus in Pneumonia Sputum. A A, Leucocytes; B B, bronchial tubes; C, epithelial cell; D, ciliated epithelium; E E, pneumococci. X 1000.

Apart from the above, the diagnosis involves differentiation from quite a range of affections, such as bronchopneumonia, pulmonary œdema, pleurisy with effusion, pulmonary phthisis, cancer of the lung, atelectasis, engorgement in fever, typhoid fever, for which the reader is referred to the articles in which these affections are discussed.

COMPLICATIONS.—There are several affections that so often appear with pneumonia as to make it reasonably certain that there is a common influence at work, and this influence can often be found in the presence of the pneumococcus in the locality in question. The following tables show the complications observed at the Presbyterian Hospital, New York:

COMPLICATIONS OF PNEUMONIA.			
Out of 488 Cases.			
	Number of cases.	Recovered.	Died.
Pleurisy with effusion.....	20	17	3
Pericarditis (acute).....	6	1	5
Otitis media.....	6	6	
Thrombosis of femoral vein.....	3	3	
Bronchitis.....	13	9	4
Jaundice.....	2	1	1
Out of 304 Cases.			
Gangrene of leg.....	1	1	
Delayed resolution.....	7	7	
Relapse.....	2	2	
Delirium tremens.....	11	5	6
Pyæmia.....	2		2
Abscess of lung.....	1	1	
Laryngitis.....	1	1	
Erysipelas.....	2	2	
Persistent bronchopneumonia.....	1	1	
Acute nephritis.....	3	2	1
Edema of lungs.....	6	1	5
Empyema.....	10		

PROGNOSIS.—This is modified by a number of pre-existing conditions, the principal of which are sex, age, season of the year, habit as to the use of alcohol, and the presence or absence of certain chronic diseases.

While pneumonia is more frequent in men, it is more fatal in women. Of 223 patients in the Presbyterian Hospital 170 were males, with a mortality of 28.8 per cent., and 53 were females, with a mortality of 31.2 per cent. The mortality in reference to age is shown by the

following table taken also from the records of the Presbyterian Hospital:

PNEUMONIA—434 CASES.				
Relation to age.	Died.	Per-centage dying.	Re-covered.	Per-centage re-covered.
Below 5 years.....	0	0	13	100
Between 5 and 10 years...	0	0	18	100
Between 10 and 15 years...	1	9	11	91
Between 15 and 20 years...	7	23 +	23	76 +
Between 20 and 30 years...	28	32 +	45	77 +
Between 30 and 40 years...	37	37 +	62	62 +
Between 40 and 50 years...	31	42 +	42	57 +
Between 50 and 60 years...	16	47 +	18	52 +
Between 60 and 70 years...	16	66 +	8	33 +
Over 70 years.....	5	62 +	3	37 +
	141	32 +	236	67 +

As to seasons of the year, the spring months give the lowest mortality, the summer shows a slight increase, while in the autumn and winter the percentage of deaths is greatest.

The habitual abuse of alcohol unfits the system to bear up against pneumonia, as is shown by the following table:

PNEUMONIA—428 CASES.				
Relation to alcoholism.	Died.	Per-centage dying.	Re-covered.	Per-centage re-covered.
Markedly alcoholic.....	36	70	15	29
Moderately alcoholic.....	52	32	109	67
Non-alcoholic.....	45	20	171	79

Among pre-existing conditions a rheumatic habit, diabetes, and chronic renal insufficiency, especially if associated with cardio-vascular changes, render the prognosis much more serious. The presence of advanced valvular disease leaves but little chance for recovery. Of the conditions arising in the course of the disease and affecting the prognosis, the first is the initial chill. This occurred in 144 out of a series of 223 cases, with a mortality of thirty-four per cent., while the remaining 79 cases in which the chill was absent gave a mortality of only nineteen per cent.

The prognosis depends largely upon the extent of the pneumonia. When both lungs are involved not half of the patients recover. Pneumonia occupying the whole of a lung is more dangerous than when only a part is involved. The right lung is more frequently implicated, and also gives a higher mortality.

A feeble pulse that is frequent in relation to the respiration and temperature is a disquieting element, as is also a very frequent respiration, especially when it occurs with a moderate temperature.

Up to 105° F. the danger does not seem to increase materially with the rise of the thermometer. A higher temperature, however, tells immediately upon the death rate.

A physical sign that has an important prognostic significance is accentuation of the pulmonary second sound. This is the result of increased tension in the pulmonary artery, and is a measure of the obstruction in the lung on the one hand, and of the power of the right ventricle on the other. If this accentuation becomes less marked it is either because the obstruction is diminished, which is a favorable sign, or because the right ventricle is becoming weaker, with all that this implies. Which of these two conditions is present is easily determined by the general symptoms.

A considerable increase in the number of the white blood cells is, as a rule, a favorable indication, while a low count is unfavorable. In anything like a severe case the prognosis is alarming if the leucocytosis remains below 12,000 or 14,000. On the other hand, a high leuco-

cytosis persisting after the temperature falls indicates further trouble in store, probably some complication.

It is generally believed that the presence of herpes labialis is of good augury. If there is an absence of expectoration in the second and third stages, or if the expectoration becomes scanty and difficult, the outlook is grave. A sudden cessation of expectoration, if accompanied by tracheal râles, indicates the near approach of death. Late delirium is an unfavorable sign, as are also apathy and somnolence.

The mortality in pneumonia differs enormously under different conditions. It is much greater in hospitals than in private practice, and in civil than in military hospitals. In civil hospitals it runs from twenty-five to thirty per cent., while in private practice it is scarcely half so great. The death rate is much higher in some years and in some localities than in other years and in other places.

ETIOLOGY.—While the essential cause of pneumonia is the development of a specific germ in the pulmonary alveoli, there must be a contributing cause that in some way opens the system to attack. Among the predisposing causes are the following:

Sex. Males are more liable to attack than females.

Age. If the total number of persons living at any given age be considered, it is probable that the ratio of cases in successive decades is fairly uniform except during the most active period of life when exposure is greatest.

Race. In America, the negro race is decidedly more liable to pneumonia than the white.

Former Attacks. A person who has passed through one attack is more liable to another.

Unsanitary Living. Pneumonia occurs more frequently in dark, crowded, and ill-ventilated dwellings than where the supply of light and air is ample.

The principal exciting causes include exposure to cold, exhaustion, the presence of some other infectious disease, and operations under the use of an anæsthetic.

Although not readily communicable, pneumonia may undoubtedly be transmitted from person to person. Indeed, it quite frequently assumes the form of a veritable epidemic. In addition to this, certain houses have been observed to furnish, year after year, an undue proportion of cases, which seems to indicate that the infecting principle lurked in the apartments.

As to the etiology of pneumonia in general, we are obliged to admit that in a large proportion of cases the attack appears to come on spontaneously.

TREATMENT.—A correct treatment of pneumonia must recognize that the disease is essentially a germ culture going on in the air cells of the affected part. The causal indication, therefore, is to inhibit this culture. The debatable question is whether such inhibition is practicable by any safe means within our reach. The writer is firmly convinced that it is; and observations sustaining this view are rapidly accumulating from many sources. The problem requires that we rid ourselves of the conception of an "inflammatory" process carrying on an independent work of its own, over and above the response of tissue to the irritation of the micro-organism. This irritation depends upon a specific vital property of the pneumococcus, as is shown by the fact that no other irritant whatsoever will produce a like result. If, therefore, we can so modify the bacterium that it loses its specific irritant property, the essentially pneumonic changes in the lung will be arrested. This then is the first indication for treatment, and it is as unwise to defer action upon it until the case becomes severe, as it would be to defer opening an abscess until the signs of pyæmia should appear.

It is clear that the material exuded into the air cells must contain its share of any substance circulating in the blood from which the exudate is derived. This makes it possible to impregnate the exudate with any desired medicament, including one inimical to the pneumococcus. It is not necessary to kill the germ; it is enough to inhibit its growth, a very much easier thing to do.

A considerable number of drugs seem to be capable of producing this effect. The salicylate of sodium or am-

monium has, up to the present time, been the most efficacious. It is given in doses of ten or fifteen grains every two hours. In a large proportion of cases, especially if given early, it will affect the temperature at the end of

tioned above have been employed with more or less success for their anti-bacterial effect, but have nothing especially to recommend them. Aside from specific measures, the treatment of pneu-

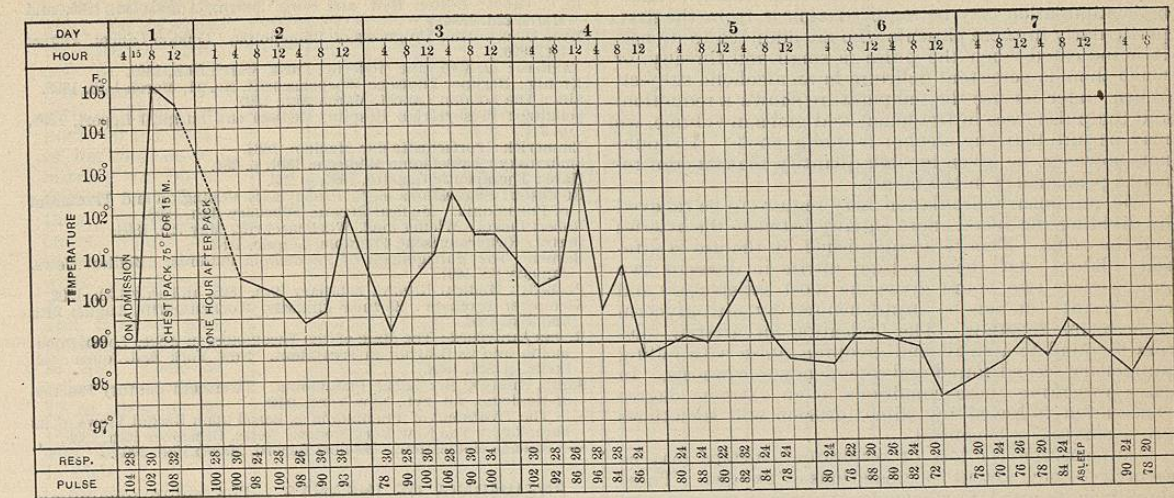


FIG. 3833.—Case Treated with Ammonium Salicylate. Patient was admitted immediately upon the occurrence of the chill, and twenty grains of the drug were administered every four hours. Temperature reached the normal on the fourth day.

twenty-four hours, and bring about a defervescence by lysis in the course of the two or three days following. Recently Dr. George Peabody has substituted aspirin in doses of fifteen grains four times a day. Of twelve cases treated in this way all ended in recovery, and in every case defervescence was by lysis.

Creosote and its carbonate have also been employed successfully in a very considerable number of cases. Of the carbonate ten or fifteen minims are given every two hours, either in emulsion or in capsules.

The substitution of lysis for crisis in a large majority

monia will be in accordance with the following indications: Stimulation of the emunctories to throw off the poison as it forms; sustaining the vital powers and particularly the heart; relieving the pulmonary circulation; compensation for loss of respiratory surface by the inhalation of oxygen; reduction of excessive temperature; relief of incidental symptoms.

It is well at the outset to relieve the bowels by an efficient cathartic, and for this purpose nothing answers so well as calomel. Its operation is often followed by a considerable fall of temperature which may be perma-

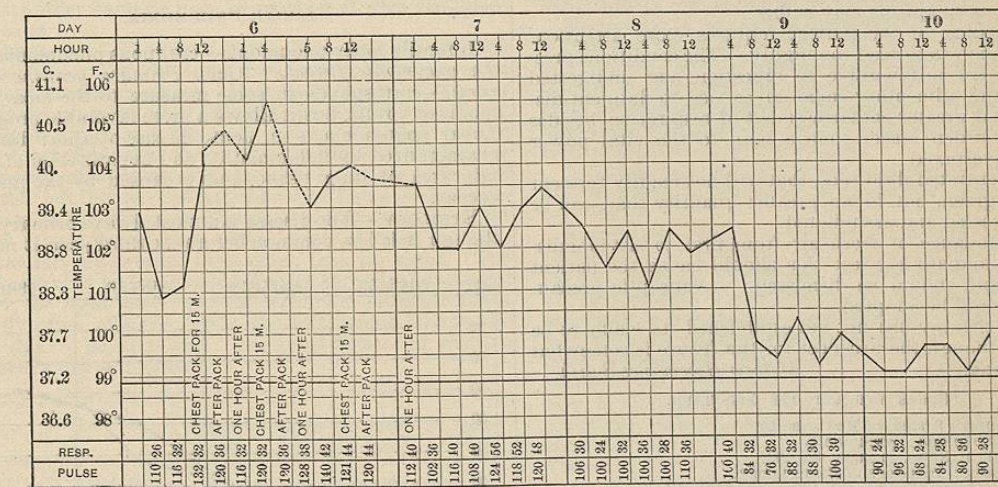


FIG. 3834.—Patient having Double Pneumonia who was Treated with Sodium Salicylate. Entered hospital on the third day of the disease with pneumonia of the lower right lobe. On the sixth day the left lower lobe became involved. Cold applied to the chest for temperature above 103.5° F., and twenty grains of sodium salicylate administered every four hours. Defervescence by lysis. Normal temperature on the tenth day.

of cases is a very remarkable result of remedies of this class, and demonstrates the power they possess to modify the usual course of the disease.

Specific medication of this kind is more efficient the earlier it is resorted to, but it is not without value at any stage of the disease. Many remedies besides those men-

tioned above have been employed with more or less success for their anti-bacterial effect, but have nothing especially to recommend them. Aside from specific measures, the treatment of pneu-

ment. If the urine is scanty a diuretic is called for, and the best of all is an abundance of cold soft water. The vital powers must be sustained, and at the first evidence of flagging strychnine, strophanthus, caffeine, or other heart tonic is called for. Much harm is done by a routine use of digitalis. This drug increases the periph-

eral resistance and thus adds to the labor of the heart, while at the same time it favors venous congestion by lessening the capacity of the arterial system. Its use is admissible when cardiac arrhythmia is present, but it should always be guarded by an arterial dilator. Alcoholic stimulation may be required almost from the first, particularly in those patients who are addicted to its use. It is indicated when the pulse is small and thready, or when there is persistent delirium in an alcoholic subject. When under its use the temperature shows a reduction, and the pulse loses in frequency and gains in volume, we may be sure that the alcohol is doing good. It should not, however, be given in such quantity that its odor remains persistently in the breath.

The pulmonary circulation may require to be relieved by dividing the blood more equally between the arteries and the veins. This is accomplished by the use of arterial dilators. Of these sodium nitrite in doses of two grains every two hours gives the most satisfactory and even result. It can be supplemented by nitroglycerin as occasion demands. The indication for arterial dilators is found in a small and creeping pulse with failing pulmonary second sound and a tendency to cyanosis. In cases presenting these conditions in an extreme degree venesection followed by saline infusion will sometimes prove singularly beneficial.

Compensation for loss of respiratory surface may be secured to some extent by inhalations of oxygen. These should be resorted to whenever the respirations exceed forty per minute, and they may be made continuous if the condition persists.

For the reduction of excessive temperature cold sponging and an ice-cap to the head are the most available means. When the fever produces extreme jactitation, tending to nervous exhaustion, the coal-tar preparations may be employed very cautiously and for brief periods.

For the relief of pain hypodermic injections of morphine are by far the best means at our command. They are efficient, and at the same time, by slowing and deepening the respiration, they improve the circulation in the affected part. They are to be used with care, however, and their frequent repetition is to be avoided. Hot poultices on the one hand, and ice-bags on the other, are preferred by many, and are fairly efficient. In mild cases dry cups or sinapisms may suffice.

The feeding of the patient requires close attention. The tendency is to feed too highly. The conditions present are very unfavorable to digestion, and undigested food in the alimentary canal gives rise to flatulent distention and greater embarrassment of respiration, besides being a burden rather than a help to the vital power already overtaxed.

A concentrated fluid food that will not readily ferment is to be given, but in no greater quantity than can be easily digested and assimilated.

An abundance of fresh air from first to last is indispensable, and anxiety lest this should cause the patient to take cold should be dismissed. "Antiseptic precautions" should be adopted.

Serum therapy has not yet established its claim to be adopted, though the prospect for the future is somewhat encouraging.

Andrew Heernance Smith.

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PNEUMONIA OF INFANTS.—The acute pneumonia of infants may assume one of two distinct types—either that of an acute lobar pneumonia or that of an acute bronchopneumonia or lobular pneumonia. The former type, which is less common than the other, is caused by the pneumococcus, develops as a primary disease, has an acute onset, runs a short course, is characterized by a continuous high temperature, ends by crisis, and allows a good prognosis. The other type of pneumonia is the most common disease of infancy, is usually secondary, may be caused by one of several micro-organisms, is variable in onset, runs an indefinite course with irregular temperature, ends by lysis, and allows a less favorable prognosis—that is, one which depends largely on the disease to which it is secondary.

LOBAR PNEUMONIA.

Infantile lobar pneumonia—croupous pneumonia; Fr., *La pneumonie franche*; Ger., *Primäre genuine Pneumonie*—corresponds in some measure to the lobar pneumonia of adults, but it allows a more favorable prognosis. Lobar pneumonia is an acute disease of short duration, characterized by inflammation and hepatization of a certain area of lung tissue, and is caused by the pneumococcus.

ETIOLOGY.—The disease is almost always primary. Although it is less common before the third year, it may occur in early infancy. In fact, cases have been reported in which the disease developed before the birth of the child.

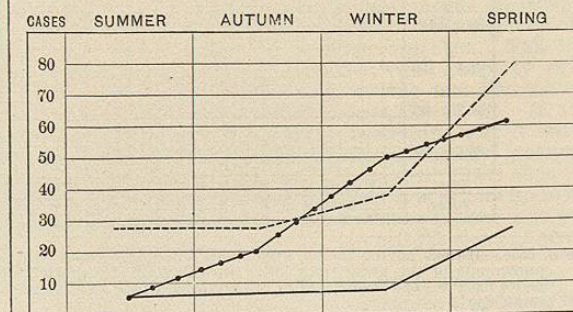


FIG. 3835.—Chart Showing the Frequency of Lobar Pneumonia in Infants and Children at Different Seasons. — Cases reported by Dr. Holt; - - - Cases reported by Dr. Comby; . . . Cases reported by Drs. Northrup and Freeman.

cur in early infancy. In fact, cases have been reported in which the disease developed before the birth of the child.

All statistics seem to agree that boys are more frequently affected with the disease than girls, the general ratio being 60 per cent. boys and 40 per cent. girls. Comby reports that in 172 cases seen by him 105 were in boys and 67 in girls. Of 44 cases reported by Henoch 24 were in boys and 20 in girls. Holt reports 60 per cent. of his cases as occurring in boys. Rilliet and Barthez, out of 408 cases, report 221 in boys and 187 in girls. Of 42 cases at the Foundling and Nursery and Child's hospitals in New York 25 were in boys and 17 in girls, or 60 per cent. in boys and 40 per cent. in girls.

SEASON.—This disease is seen most often in the spring. The accompanying chart (Fig. 3835), constructed from data by Comby and Holt and the authors of this paper, shows the frequency of lobar pneumonia, in children, in New York and Paris at different seasons. Exposure to cold, traumatism, contagion, and previous poor health have been mentioned as occasional etiological factors; but if they do play any part in the production of this disease, except by lowering the resistance, this must be true only in rare instances. The micro-organism regularly found in the sputum and in the lesion, and occasionally in the blood, is the micrococcus lanceolatus or pneumococcus of Fränkel. Various other bacteria may be associated with the pneumococcus.

PATHOLOGY.—The focus of the disease may be located in various parts of the lung, but certain lobes are more often affected than others. Holt finds that the left lower lobe is the one most often affected, the next in order being the right upper and the right lower. Comby, on the other hand, finds that the right upper lobe is much more frequently affected, the next in order being the left upper and the left lower. Monti, who has had a large experience with the disease in Vienna, considers that the right upper lobe is much more often involved than the left, and the left lower much more often than the right. The cases collected by the present writers show that the right upper, the right lower, and the left lower lobes are about equally often affected, while the left upper lobe is the least apt to be involved. The exact figures of relative frequency are as follows:

	Right upper.	Right lower.	Left upper.	Left lower.
Holt	2	3	..	1
Comby	1	..	2	3
Ashby	2	1
Northrup and Freeman	2	3	..	1

So far as its general characters are concerned, the lesion of lobar pneumonia in children corresponds to that in adults. It will therefore not be necessary to describe them here in detail (see article on *Pneumonia, Lobar*, by Dr. A. H. Smith). The disease is an acute exudative inflammation of the lung, in the course of which the air spaces become filled with red and white blood cells, serum, and fibrin. At the same time there is developed

a toxæmia from the absorption of the poisons which are produced in the lungs. The lesions are not usually in the same state of development in all parts of the involved lung tissue at the same time, for while one area is in the

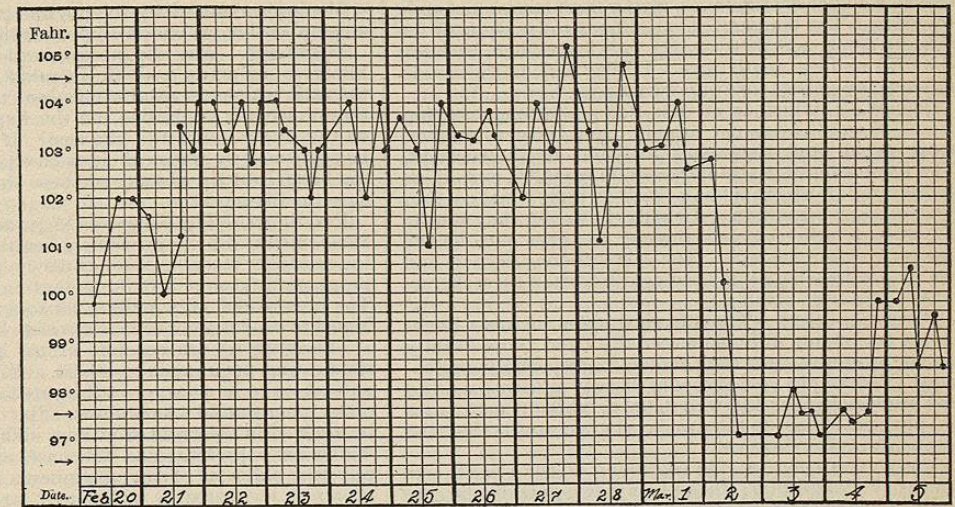


FIG. 3836.—Temperature Chart of a Case of Lobar Pneumonia in a Baby of Nine Months.

condition of red hepatization, a neighboring area may show gray hepatization.

Resolution does not always take place. The products may persist and become organized, or they may break down and form an abscess, or, finally, a necrotic process may ensue and gangrene manifest itself. In the lobar pneumonia of infants, however, these terminations are less often observed than they are in adults.

Pleurisy, with the development of fibrin only, or with a plastic exudate, or with pus, may accompany the pneumonia. A bronchitis is usually present. Pericarditis, endocarditis, and meningitis occasionally occur.

No sputum is, as a rule, expectorated by infants, all that is coughed up is swallowed. We have found that the sputum may best be obtained for microscopic examination by washing out the stomach half an hour after the child awakes and before food is given. Where this fails sometimes titillating the pharynx causes cough and ejection of small masses of mucus.

A leucocytosis appears at the beginning of the disease, and increases in intensity, disappearing as the temperature drops.

SYMPTOMS.—There is no incubation stage in the lobar pneumonia of infancy. The baby becomes suddenly very severely ill. It usually vomits and has a rapid rise of temperature. Convulsions may occur with the onset, especially in infants that have rachitis. Chills are rarely seen with the onset of the pneumonia of infancy. The child becomes dull and apathetic. With the rise of temperature the pulse rate is increased, while the respiration is increased out of proportion to the pulse rate. Thus the ratio of respiration to pulse, which normally should be one to four, approximates that of one to three. The child develops a short dry cough, and is apt to have an expiratory grunt. The alæ nasi expand with each inspiration. The child's face is usually flushed and the skin dry. The severity of the attack may usually be judged from the degree of elevation of the temperature. Cerebral symptoms often accompany the disease. Convulsions are occasionally seen, while stiffness of the back of the neck, stupor, and delirium are often present.

The typical temperature chart of the lobar pneumonia of infancy shows a rapid rise of temperature to about 104° F., slight morning remissions and evening exacerbations continuing for less than a week, and the disease ending by crisis. Such a chart is shown in Fig. 3836; it