

a pneumococcus, at least so far as modern standards of identification permit. They further detail experiments demonstrating the exceedingly great virulence these strains possess for susceptible laboratory animals. A guinea-pig of 328 gm. weight was dead ten hours after an intraperitoneal injection of half the twenty-four-hour growth on a blood agar slant of one of the strains isolated from the heart's blood. The virulence of these strains exceeds by far that known for pneumococci usually associated with disease, and while the organisms meet all the morphologic and cultural require-

TABLE 1.—HEART'S BLOOD CULTURES, POSTMORTEM

Cul- ture	Inulin Fer- menta- tion	Capsule		Bile Sol- ubility	Amount of 1-24 Hr. Blood Agar Slant Injected into W. Mouse	Dose Fatal in Hours	Type	Organ- ism Re- covered Pure from Mouse Heart's Blood
		On Blood Agar	In h. b. of Mouse					
1024	+	—	+	+	0.0231	38	II	+
1029	+	—	+	+	0.0231	26	II	+
1030	+	—	+	+	0.0231	31	II	+
1031	+	—	+	+	0.0231	25	II	+
1032	+	—	+	+	0.0231	25	IV	+
1033	—	—	+	+	0.0231	25	IV	+
1034	+	+	+	+	0.0231	25	IV	+
1035	+	—	+	+	0.0231	31	II	+
1037	—	—	+	+	0.0231	27	II	+
1038	+	—	+	+	0.0231	25	II	+
1039	+	—	+	+	0.0231	25	II	+
1040	+	—	+	+	0.0231	24	IV	+
1041	—	+	+	+	0.0231	30	IV	+
1050	+	—	+	+	0.0231	28	II	+
1053	+	—	+	+	0.0231	43	II	+
1056	+	—	+	+	0.0231	21	IV	+

ments of a pneumococcus, this difference in virulence makes them distinctive.

To control these investigations, throat cultures were taken from fifty of the German prisoners confined at Camp Grant. This group of men has escaped entirely the infection, although they have been in the camp since last spring. Colonies of pneumococci were found in twenty of these cultures and isolated in pure culture. White mice were inoculated with half the

TABLE 2.—BLOOD CULTURES

Cul- ture	Inulin Fer- menta- tion	Capsule		Bile Sol- ubility	Amount of 1-24 Hr. Blood Agar Slant Injected into W. Mouse	Dose Fatal in Hours	Type	Organ- ism Re- covered Pure from Mouse Heart's Blood
		On Blood Agar	In h. b. of Mouse					
604	+	—	—	+	0.0231	18	II	+
605	+	—	+	+	0.0231	22	II	+
606	+	—	+	+	0.0231	22	II	+
608	+	—	+	+	0.0231	24	IV	+
610	+	—	—	+	0.0231	18	IV	+
611	+	—	+	+	0.0231	30	IV	+
614	+	—	+	+	0.0231	12	II	+
615	+	—	+	+	0.0231	16	II	+
630	—	—	+	+	0.0231	32	II	+
636	—	+	+	+	0.0231	22	II	+
638	+	—	+	+	0.0231	16	IV	+
640	+	—	+	+	0.0231	22	II	+
646	+	—	+	+	0.0231	18	II	+
651	+	—	+	+	0.0231	68	I	+
654	+	—	+	+	0.0231	22	II	+
655	+	—	+	+	0.0231	14	II	+
660	+	—	+	+	0.0231	30	IV	+
663	+	—	+	+	0.0231	16	II	+
664	+	—	+	+	0.0231	22	IV	+
665	—	—	+	+	0.0231	16	II	+
666	—	—	+	+	0.0231	36	II	+

growth of these organisms on blood agar slants after twenty-four hours' incubation without the slightest effect on these animals.

CONCLUSIONS

1. The epidemic of bronchopneumonia at Camp Grant is due to infection by a virulent strain of pneumococcus.

2. The virulence of this organism exceeds greatly that of strains usually identified in pneumonia.

TABLE 3.—LUNG CULTURES, POSTMORTEM

Cul- ture	Inulin Fer- menta- tion	Capsule		Bile Sol- ubility	Amount of 1-24 Hr. Blood Agar Slant Injected into W. Mouse	Dose Fatal in Hours	Type	Organ- ism Re- covered Pure from Mouse Heart's Blood
		On Blood Agar	In h. b. of Mouse					
265	+	—	+	+	0.00555	30	IV	+
276	+	—	+	+	0.00555	24	IV	+
287	+	—	+	+	0.00555	18	IV	+
288	+	—	+	+	0.00555	24	II	+
291	+	—	+	+	0.00555	24	II	+
293	+	—	+	+	0.00555	18	II	+
294	+	—	+	+	0.00555	29	II	+
295	+	—	+	+	0.00555	32	II	+
343	+	—	+	+	0.00185	36	II	+
358	+	—	+	+	0.00185	30	IV	+
369	+	—	+	+	0.00185	36	II	+
384	+	—	+	+	0.00555	14	IV	+
398	+	—	+	+	0.00555	23	II	+

3. This virulence is such as to explain the epidemic of bronchopneumonia.

4. *Bacillus influenzae* played no rôle in the epidemic at Camp Grant.

CLINICAL OBSERVATIONS ON
INFLUENZA

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The epidemic, or rather pandemic, of influenza through which Chicago has just passed has afforded me an opportunity of making observations that it might be of interest to record, as they were made in family practice, which is not so well represented in medical literature as is that of the hospital, even though the vast bulk of the work of the medical profession lies in the former field rather than in the latter.

One of the startling features of the pandemic was its sudden flaring up and its equally sudden decline, reminding one of a flame consuming highly combustible material, which died down as soon as the supply of the material was exhausted. There is every reason to believe that, within a few weeks of its onset, the infection was universally present in the nose and throat of the people, disseminated by mouth spray given off on talking by innumerable carriers and, in addition, by the coughing and sneezing of the sick. Susceptibility was very general, though it varied greatly in degree. Among those who escaped well marked sickness there are few who could not recall having had an occluded or running nose, or a raw feeling in the throat, or a cough, or aches and pains, at some time during the period of the prevalence of the disease, these probably representing the price such persons paid for their immunization. That blood relationship had something to do with susceptibility was shown by the fact that, in some families, every member developed the disease in well marked form, while in others there was not one definite case, though exposure to the infection had taken place. The very old and the very young showed themselves, on the whole, less susceptible.

In view of this universal prevalence of the infection, quarantine was necessarily useless. During this pandemic, wearing of face masks had no greater prophylactic effect than the liberal consumption of whisky

that was indulged in by some for this purpose, or the traditional camphor bags that were found hanging about the necks of so many children sick with influenza. That face masks were useless in protecting one against the infection was shown by the fact that nurses, who of all people were especially given to wearing them, were notoriously prone to become victims of the infection. This is easily understood when we realize that the conjunctiva is continuous with the respiratory mucous membrane and that the eye, unless especially protected, is particularly exposed to bombardment by minute particles in the air. Of course, face masks are useful to protect others against infection by the mouth spray of the wearer.

The symptomatology of the disease was quite multifiform. Thus, there were cases that merely showed fever without aches and pains, and others in which there were aches and pains without fever, though generally both were present. Profuse sweating occurred in most cases, increased undoubtedly by the medication employed. The majority of patients coughed, some coughed and vomited, and some vomited and did not cough. The nose was not as frequently affected as were the bronchial tubes. When it was involved, there was a marked tendency to nosebleed. The throat was rarely complained of. Its examination merely revealed hyperemia, and only exceptionally follicular exudate. A few cases of dysenteriform disturbance were encountered. Prostration was generally out of proportion to the height and duration of the fever.

The average duration of the disease in uncomplicated cases was about three days. There was, however, quite a tendency to the occurrence of a relapse, increased, it seemed, by getting out of bed prematurely. The relapse was in some cases more severe than the primary attack, and in others less severe.

Bronchopneumonia was the most important and most serious complication. In every case of pneumonia that I observed in this epidemic, its occurrence was apparently due either to inability or unwillingness, on the part of the patient, to stay in bed long enough or thoroughly enough; or to physiologic handicaps, such as pregnancy, organic heart disease, chronic bronchitis, infancy or old age; or, most especially, to these two influences combined. Over and over again, this was the story: The patient had an ordinary attack of influenza, during which he did not stay in bed continuously. He then felt a little better, got up, and was taken sick again—this time with severe symptoms—and he soon displayed the phenomena of bronchopneumonia. On the other hand, patients who from the beginning of their sickness were kept in bed continuously, and who staid in bed until they had been perfectly well for two or three days, seemed to be quite immune from this complication. If thorough bed treatment of the attack of influenza actually prevents bronchopneumonia, as is my belief, then we must consider this treatment of life-saving importance. How bed treatment might prevent pneumonia, as well as lessen the tendency to relapse, can be understood when we think of an attack of influenza as a state during which the victim of the infection acquires immunity against the organisms that are attempting to invade his system. We have abundant evidence that warmth favors the development of immunity, and that chilling antagonizes it. A patient who is kept in bed at a uniform temperature is therefore in a favorable condition to triumph over the

enemy within him. Chilling, on the other hand, weakens the defenses and turns the tide of battle against the patient. Sweaty skins and wet garments predispose to chilling. Thus it is easy to see why the freely perspiring influenza patient must be particularly susceptible to chilling. Especially critical is the period when the patient's temperature is just falling to, or below, the normal. He is then commencing to feel fairly well, and sees no reason for staying in bed. With skin and garments wet with perspiration, he gets out of bed, but soon returns, chilly and miserable, having lost the immunity that was just becoming established. A relapse or an attack of bronchopneumonia is the result.

The time the patient should remain in bed might be placed, for mild cases, at from two to three days, counted from the time the patient has commenced to feel perfectly well for a whole day. For severe cases, and in handicapped patients, or when fine crepitant râles continue to be heard in the chest, the time taken for full establishment of convalescence should be considerably increased.

As it is important to protect the patient against chilling, use of the bed pan and of the urinal must be insisted on. This also prevents the fainting on going into the toilet room that occurred in quite a number of cases. It is no less important to keep the patient's garments and bedclothing dry. The danger of wet clothing is best appreciated when it is realized that a person wrapped in wet fabric loses heat faster than the same body would if it were naked. To keep these profusely perspiring patients dry is quite a task, which should, however, be faithfully carried out by the nurse, who, on removing the wet garments, should rub the patient dry with a warm towel and apply warm, dry clothing, all this being done under covers. The proposition of keeping the patient warm must not be carried out to the extent of keeping the patient hot. The temperature of the sick room should not exceed 70 F. Nor does this proposition militate against free ventilation, provided this is carried out so as to admit fresh air liberally into the room without exposing its occupants to the danger of chilling. For most of these cases, good nursing was more important, as well as more difficult to secure, than good doctoring. This pandemic occurring at a time when there was such great scarcity of trained nurses, on account of the war, brought home to us how necessary it is for every woman—and every man—to be at least somewhat skilled in nursing the sick.

In view of the absence of specific treatment, the therapy of this disease had to be symptomatic. This form of therapy—often disdainfully characterized as “merely symptomatic”—represents, in my view, the very acme of the medical art. Perhaps, if we would instead use the term “functional therapy,” as has been suggested, its significance and importance would be better appreciated. It is our duty and privilege to take care of the derangements of the patient's functions while his system is fighting the infection. Since these derangements were of most varied character and intensity, such a thing as a routine treatment of influenza is obviously an absurdity.

The symptom that perhaps attracted most therapeutic attention, and probably least deserved it, was the fever. This was rarely high enough to be of detriment to the patient. When it became too high—exceeded,

let us say, 104 F.—it was easy to reduce it by hydrotherapy or by antipyretic medication. On the other hand, a proper object of therapeutic attack were the pains and aches to which so many of these patients were subject. It was their analgesic, rather than their antipyretic action, that rendered various coal-tar derivatives so useful in this condition. It made very little difference whether acetylsalicylic acid or other salicylate, acetphenetidin, antipyrin or pyramidon were selected, provided the proper dose was chosen, namely, the smallest possible dose adequate to produce the desired result. I have seen as little as 0.12 gm. of acetphenetidin or of pyramidon, when given every hour, followed within a few hours by complete relief of the discomforts against which they were administered. The chief disadvantage of all these bodies is their great sudorific action. This at times made the patients more uncomfortable than the aches against which they were used. Hence, when great pain was complained of, and its antitussic action did not render it contraindicated, I have added an opiate—generally codein phosphate, 0.03 gm., to each dose of pyramidon—rather than to increase the dose of the coal-tar analgesic. It is a somewhat disagreeable thing to reflect on that this treatment might make the patient feel so comfortable that, considering himself well before he really is, he may interrupt his bed treatment prematurely and thus invite occurrence of relapse or even of pneumonia.

The proper management of the cough is probably of fundamental importance. If retention of secretion and clogging up of bronchioles favors the development of bronchopneumonia, as it is only reasonable to believe, then favoring expectoration may save life. It has been my good fortune to come across a number of patients in whom, from the rapid and distressed breathing, the almost nonproductive cough, and the innumerable fine râles in the chest, one feared the onset of pneumonia, that cleared up phenomenally, within a couple of days, under the influence of iodid coupled with the liberal ingestion of fluid. In milder cases, I have used, as expectorant, ammonium chlorid in doses of 0.3 gm. prescribed with a flavoring syrup vehicle and taken in half a tumblerful of water, every two hours. But, when the more serious nature of the case demanded a more drastic action, or when the patient obtained no relief from the ammonium chlorid, I have nearly always succeeded in securing a satisfactory result by the addition of 0.12 gm. of sodium iodid to each dose of ammonium chlorid, given in cases in which prompt action seemed urgent every hour, and later, every two to four hours. The interval between the doses is increased as expectoration or nasal discharge become freely established. Reasoning and clinical observation have led me to believe that any expectorant given for the purpose of loosening secretion is likely to be disappointing unless its administration is accompanied by the liberal ingestion of fluid. Hence I have urged the ingestion of a tumblerful of fluid every hour, while the patient is awake, having the patient take a tumblerful of milk or other nutritious fluid every two hours, and a glassful of lemonade, grape juice and water, seltzer water, or other drink every two hours, alternating with the milk. When the secretion has become profuse, an aromatic expectorant like creosote carbonate would seem to be indicated. However, in these cases I have found this agent

unsatisfactory. In a number of instances, discontinuance of the iodid and use of creosote carbonate in 0.3 gm. doses every four hours was followed by prompt aggravation of the cough and increase in the number of râles heard in the chest, as well as the reappearance of fever. I therefore now reduce the daily dosage of iodid very gradually instead of stopping it abruptly, and have not employed creosote carbonate of late, even when the expectoration has seemed excessive. I believe that the prescribing of an opiate, whether by itself or in complex cough syrups, is pernicious practice, a direct invitation to the onset of bronchopneumonia. An exceptional case may be found now and then, in which a patient with a chest free from physical findings is kept from sleep by a useless, absolutely nonproductive cough. In such a case, a sufficient dose of codein, 0.03 gm. every hour at bedtime for a few doses, secures a good night's rest; and the ingestion of a dose every four hours during the day maintains comfort. When, however, the cough is at all productive or there are râles in the chest, experience has made me afraid to prescribe opiates in any form or any dose. Even if the opiate is not followed by the development of bronchopneumonia, it will prolong the duration of the trouble, as the harassing cough returns as soon as the opiate is stopped. Should the cough be excessive and interfere with sleep, it is well to try to lessen the nervous excitability by means of bromid, which may be given combined with the iodid.

Insomnia should not be permitted in these patients for more than one night. Since sleep is as important as food for the maintenance of strength, and as we never know at the beginning how long the case may last or how serious it may become, it is, to say the least, prudent to procure sleep for the sufferer. The sleep must not be sufficiently profound or continuous, however, to abolish coughing for many hours. I have found it convenient to carry with me 0.3 gm. barbital tablets and to have the patient who has difficulty in going to sleep take one at bedtime, to be repeated in two hours if he is not yet asleep. As barbital has not proved uniformly successful, I have prescribed with more complete satisfaction in those cases in which barbital failed, 0.3 gm. of chloral hydrate to be repeated every hour until the patient is asleep. Of course, the chloral could not be used in patients with enfeebled circulation.

A tendency to vomiting on slight provocation was so generally present, especially in children and young women, that it was found wise to limit the patient to liquid diet. Eating crackers or an apple has precipitated an attack of emesis. Medicine was also likely to do this, especially the administration of ammonium chlorid. Hence it is well to start this medication cautiously in those predisposed to emesis, by giving at first one-fourth and later one-half the desired dose and not going up to the full dose until one feels confident that it is likely to be tolerated. With some patients, vomiting was a prominent and distressing symptom. In such cases, twenty-four hours of complete rest to the stomach, even to the extent of limiting the ingestion of water to teaspoonful doses every fifteen minutes and withholding all medicine, usually controlled the difficulty. To prevent dehydration of the system and the development of acidosis, as well as to favor expectoration, retention enemas of 250 c.c., or of as much as the patient could hold, of physiologic

sodium chlorid solution with sodium bicarbonate, two teaspoonfuls to the quart, were used from every four to eight hours, the shorter intervals being employed when the amount that could be retained was rather small.

It would consume too much space to describe in detail all the other measures that were found useful: such as prolonged irrigation of the auditory meatus with hot water followed by hot glycerin for earache, the use of menthol for the rhinitis, or of the potassium chlorate-ferric chlorid gargle for sore throat, when disturbance of these parts was prominent; strapping the lower border of the ribs with adhesive plaster for pain and soreness due to strain from coughing, and the application of the ice bag for excessive headache, or mustard poultices to especially sore areas elsewhere. The employment of cathartics was, of course, quite generally required. Solution of magnesium citrate was so popular for this purpose that druggists could hardly put it up fast enough during the pandemic to keep ahead of the demand.

I am fully aware of the fact that the great shortcoming of such reports as this one is its lack of numerical data and hence of definiteness, and the consequent difficulty of arriving at scientific conclusions. Even though the observations laid down were made in more than a thousand cases of influenza, many of these were seen only once. Hence it is impossible to be certain of the subsequent course in a considerable number of these cases. Some of these patients may subsequently have developed pneumonia and called another physician. Among those treated from the very beginning, whose subsequent course was known, bronchopneumonia occurred in four cases.

One patient was a pregnant woman who did not stay in bed during the first febrile period, because for a part of the time she had to take care of herself and of a sick baby. She recovered.

One patient, a young foreigner, came to my office with a temperature of 103 F. When he arrived home with instructions that he must go to bed and stay there, his wife turned him out of the house, saying that she had to look out for herself and her children. He stayed without care in a rooming house for three days, and when I saw him again he had a violent hemorrhagic bronchopneumonia from which he died.

A young man with valvular heart disease, who was taken care of by his mother and who refused to stay in bed for evacuation of urine and feces, developed pneumonia and died from it within five days of the beginning of the disease.

An old woman, who probably stayed in bed from the commencement of her illness, developed an extensive bronchopneumonia involvement from which she died after ten days.

In nearly every instance of about twenty-five cases of bronchopneumonia seen for the first time after the establishment of this complication, there was a history of incomplete bed treatment; and, in some, considerable evidence that the physician previously in charge had used an opiate.

SUMMARY.

Bronchopneumonia, the great cause of death from influenza, is probably in a considerable proportion of cases a preventable complication.

The prevention of bronchopneumonia rests chiefly on the enforcement of sufficiently thorough and prolonged rest in bed, and the favoring of free expectoration by the copious ingestion of fluid and perhaps the use of iodid and the avoidance of opiates.

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ACUTE VEGETATIVE ENDOCARDITIS WITH MULTIPLE SECONDARY FOCI OF INVOLVEMENT

DUE TO MICROCOCCUS PHARYNGITIDIS-SICCAE *

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Medical work in the armies of this country and of European countries has brought to light, not only new diseases, like trench fever, but also manifestations of infectious agents previously infrequent in civil life. As examples of the latter may be mentioned the increasingly great importance of the hemolytic streptococcus as a cause of pneumonia and of empyema in this country during the past winter, and the causation of bacteremia and other conditions by *M. catarrhalis*, previously considered almost if not quite harmless, as reported by British army surgeons. Of a similar nature, that is, a fatal infection by an organism ordinarily a harmless parasite, is the case reported herewith. Terminal infection by *B. coli* and other normally nonpathogenic bacteria occurs frequently enough in individuals whose resistance has been weakened by other disease. In the case reported the organism concerned has probably never before caused an infection of the kind described, and the infection occurred in an individual who was doing full military duty and who was not weakened by any other disease condition.

REPORT OF CASE

Clinical Course.—A private, white, aged 25, a member of the Headquarters Company of the Military Police was admitted to the base hospital, Camp Jackson, July 25, 1918. The family history was negative. He had had pneumonia in 1913; otherwise the previous history was negative. Particularly is it to be noted that he had never had rheumatism. July 17, while in the city of Columbia, he complained of headache, fever, and pains all over the body. He remained in the barracks until July 22, when he reported for duty. July 24, he was drenched in a storm. He reported at sick call next morning, complaining of pains and aches all over the body, and was sent to the base hospital. On admission the lungs and abdomen were negative. Old herpes labialis was present. The heart was not enlarged, the sounds were of good quality, and a loud systolic murmur was present at the apex. On the four days following admission the clinical record makes no note of anything of importance except fever. July 30, petechial spots were noted on the abdomen. July 31, the following notes were made by Major W. W. Herrick, Chief of the Medical Service:

"Mentally alert. Does not look very toxic. Heart: Apex difficult to locate, apparently in nipple line; right border $1\frac{1}{2}$ inches from midsternum; at apex a loud, rough, blowing systolic murmur, heard in the left axilla and also all over the precordium. Lungs clear. Spleen felt one-half inch below ribs. . . . Profuse petechial eruption over trunk and extremities. A few on the conjunctiva and one on the hard palate."

The diagnosis at this time was septic endocarditis, probably streptococcic. August 1, there was shortness of breath and cyanosis of the finger tips. August 2, the petechial rash was very general over the trunk, and the systolic murmur at the apex was harsher and louder than before. On this day he became irrational. August 3, the pulse was weak, rapid and thready, and the patient was irrational and unconscious. He died at 4:15 a. m., August 4.

Repeated examinations of the blood for malaria were negative. Blood cultures were made, July 30 and August 2. Each

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