that this type of pneumonia was introduced to Great Britain during the war and that its incidence has increased since 1944.

Finally it must be remembered that serological diagnoses in pneumonia are made retrospectively. The results are not available in time to assist in immediate diagnosis or to act as a therapeutic guide. Decisions about the management of a case will often have to be made on clinical grounds alone, bearing in mind, of course, that other factors besides a virus cause may account for failure to respond to penicillin or sulphonamides.

Summary

110 cases of pneumonia admitted to Hammersmith Hospital between October, 1949, and September, 1950, were fully investigated from the aetiological point of view.

In 58 cases laboratory investigations provided specific aetiological evidence—29 were pneumococcal, 10 staphylococcal, 4 tuberculous, and 10 associated with significant titres of cold agglutinins. There were two cases of Q fever and three doubtful cases of psittacosis. Eleven cases, scattered among the other aetiological groups, showed serological evidence of recent infection with the virus of influenza B.

In 52 cases no specific aetiological agent was identified, but 21 of these had had chemotherapy before admission. Reasons are given for suggesting that in these 52 cases there were few, if any, attributable to any specific but as yet unidentified aetiological agent.

The clinical aspects of the various aetiological groups are discussed.

The bacteriological investigations, on which so much depended in this work, were carried out successively by Dr. Hilda Boffa, Dr. D. R. Barry, Dr. M. Millard, and Dr. O. G. Jones. We are most grateful to them and to Dr. W. Hayes, Dr. D. A. Mitchison, and Dr. G. M. Ross, of the Department of Bacteriology, Postgraduate Medical School of London, who have taken a keen interest in the study. We are glad to acknowledge the help of Dr. J. V. Dacie with the cold agglutinin estimations. We also record our gratitude to our colleagues in the Department of Medicine, who have allowed us to investigate their patients, and to the nursing staff and laboratory technicians who have done so much to assist our work.

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In its *Annual Report, 1951*, the National Institute for the Deaf (105, Gower Street, London, W.C.1) notes that many of the larger cinemas, including 300 on the Gaiety and Odeon circuits, have now had hearing-aids installed to help partially deaf members of the audience. These aids are not yet being fully used, and the Institute is arranging social evenings in collaboration with Circuits Management Association, Ltd., to popularize their use among the hard of hearing.

LUNG INVOLVEMENT IN INFLUENZA

BY

JOHN FRY, M.B., F.R.C.S.

(From a General Practice)

This is a report on a group of cases seen in a general practice during last winter's influenza epidemic. This practice, a single-handed one, is situated on the south-eastern urban outskirts of London, and consists of approximately 4,000 patients, who belong sociologically to the "lower middle classes."

During a period of seven weeks, from the end of December, 1950, until mid-February, 1951, 223 cases were diagnosed as epidemic influenza, and it is these cases which are reported. This figure represents 6% of the total population of the practice. It should be pointed out that there must at the same time have been quite a considerable number of other cases of mild influenza, for which medical advice was not sought.

Diagnosis

The word "influenza" has unfortunately become a byword in clinical medicine for the description of almost any vague clinical short-term febrile condition without any localizing signs. Influenza can be definitely diagnosed only by isolating the virus from a suspected case. This, however, is a costly and impracticable procedure in general practice. The diagnosis is much more accurate during an epidemic than when dealing with sporadic interepidemic cases. It is thus probable that the diagnosis was correct in these cases. Epidemic influenza is a specific disease, both aetiological and clinically.

The clinical features on which the diagnosis of influenza was based in this series correspond exactly with those reported in previous epidemics (French, 1920; Stuart-Harris *et al.*, 1937). Most patients presented a remarkably uniform picture, case after case exhibiting features which differed from one another only in grades of severity.

The patient, usually in good health, is suddenly taken ill. This sudden onset is characteristic. The most frequent early symptoms, apart from general malaise and fever, were frontal headache, pains in limbs and back, pain behind the eyes, and symptoms of irritation of the respiratory tract—that is, cough and coryza. Gastro-intestinal symptoms were not common. In 12 patients vomiting occurred during the early phase, but diarrhoea was not noted in any case. If "gastric influenza" is a clinical entity one would expect to see a good number of cases with vomiting, abdominal pain, and diarrhoea during this period of the epidemic. Such cases were not seen. It is therefore probable that "gastric influenza" is a loose and inaccurate term for gastro-intestinal upsets of unknown aetiology, and its use is deprecated.

On examination at this early stage there were no localizing signs. There was marked constitutional upset, the patient being drowsy, heavy-eyed, feverish, and ill-looking. The fever varied from 99 to 105° F. (37.2 to 40.6° C.), and the pulse rate was correspondingly rapid. The fauces were injected, but no exudate was seen. The normal course of the uncomplicated case was persistence of symptoms and fever for two to five days. The

cough, however, went on for a further two to three weeks. Most of the patients were fit to resume their normal duties in 14 days.

The age distribution of these cases is shown in Table I. The youngest patient was 4 and the oldest 85. The majority were between 20 and 60, the average being 38½.

TABLE I.—Age Distribution

Age:	0-9	10-19	20-29	30-39	40-49	50-59	60-69	70-79	80-90
No. of cases	5	17	36	63	27	49	15	8	3

There were 130 males and 93 females. Note was made of the degree of involvement of family groups. In the whole series there were 30 (14%) instances of familial involvement—that is, more than one case per household. These accounted for 71 individual infections. This is surprising, as there remain 152 persons who were apparently the sole cases of influenza in their particular household. There is an obvious possible error in that in other cases which may have occurred medical attention was not needed or sought. It does suggest that the degree of personal infection in this series was not great.

In the group of cases with definite lung complications (see below) there were eight instances of familial involvement out of 37 cases (22%). No deaths occurred in this series and no patient required admission to hospital. Only five patients were aged under 10 years; this is in keeping with the 1918-19 epidemic. The illness in these appeared to be more severe, with persistent lung signs in all the cases, but recovery was rapid and complete. Difficulty was experienced in diagnosing influenza in children. It was felt that this diagnosis was the correct one, as in all the five cases there had been previous adult cases in the household, and during the period under discussion there was a relative paucity of other seasonal respiratory tract infections. The clinical picture in these children was similar to that in the adult, with a sudden onset, but the child appeared more ill and signs and symptoms were particularly referable to the chest.

Differential Diagnosis

It is appropriate at this stage to say a few words concerning the diagnosis of influenza. As has already been stated, accurate diagnosis is not easy, because there are many other common and uncommon ailments with similar initial clinical features.

Febrile Catarrh.—This condition, although having many features in common with epidemic influenza, should be differentiated. According to Stuart-Harris *et al.* (1937), the onset is more insidious, with a premonitory "cold in the head." The subsequent course is dominated by a paroxysmal cough and a sore throat, which is a prominent feature in this condition. Headache is not so frequent and there is less general constitutional upset. These investigators were unable to isolate the influenza virus from cases with these features.

Acute Tonsillitis.—This condition is commonly met with in epidemic form in general practice, and it often follows a dry and warm spate of weather. There is a sudden onset with a marked constitutional upset, fever is usually above 101° F. (38.3° C.), and there is an extremely sore throat. Cough and coryza are absent. On examination the tonsils show a whitish-grey exudate.

Miscellaneous Group.—Under this heading can be grouped conditions such as atypical and lobar pneumonias, pyelitis, infective hepatitis, and meningitis—in fact, any febrile condition can initially present as "influenza." In these cases localizing signs are usually found in a few days.

Chest Complications and Clinical Classification

It was possible, retrospectively, to classify the cases seen into a number of separate clinical groups, depending on the severity with which the respiratory tract was involved.

Group 1: No Involvement of the Respiratory Tract

Twenty cases presented with a sudden onset of illness characterized by malaise, headache, and limb pains, but with no cough, sore throat, or nasal discharge.

Group 2: Typical Influenza with no Lung Involvement

These cases presented with the typical clinical picture already described, and there were no persistent abnormal physical signs in the chest. This was by far the most frequent form of presentation, there being 166 cases. The probable pathology was that of a tracheitis and pharyngitis.

Group 3: Signs of Lung Involvement but no Pneumonic Consolidation

This group was particularly interesting. There were 33 cases (12 male, 21 female). The age incidence is shown in Table II. The oldest was 78 and the youngest

TABLE II

Age:	0-9	10-19	20-29	30-39	40-49	50-59	60-69	70-79	80-90
No of cases in Group 3	5	—	2	6	2	9	3	6	—
Total No. of influenza cases	5	17	36	63	27	49	15	8	3

4, the average age being 46. All except six had a previously clear medical history. Of these six, one was a manic-depressive, two were hypertensives, one man aged 36 had slight ankylosing spondylitis, one little girl aged 4 had suffered from mild asthma, and one man had had recurrent winter coughs. It was at the two extremes of age that the proportion of these cases was highest.

Clinically a further subdivision could be made as follows:

(a) **Signs Present at Onset (Three Cases).**—The patient presented with a severe typical influenza, and during the initial examination and follow-up persistent inspiratory rales were noted. This picture was found in three patients.

(b) **Signs Found After a Latent Period (30 Cases).**—All these cases had a similar history. The onset was as in the typical case, but instead of the condition settling in three to six days the patient continued to feel ill and had a most distressing and irritating productive cough. Sputum was quite profuse, being sticky and mucopurulent. In two cases persistent blood-staining was observed. Pain in the chest, overlying the site of the lesion, was complained of by six patients. This pain was not a typical pleuritic pain, but more dull in character. A pleural rub was heard in three patients. One patient complained of left shoulder-tip pain in association with a left basal lesion. On examination the patients looked ill, but were not severely distressed apart from the cough. There was no cyanosis or dyspnoea. The respiratory rate was normal in all cases. Fever was not particularly high: in only three cases was a figure of over 101° F. (38.3° C.) recorded. A most striking feature was the frequency with which a relative bradycardia

was observed. In 10 adults the pulse rate was below 70. The characteristic features were found in the chest, and consisted of a slightly impaired percussion note, diminished air entry, and fine inspiratory rales over the affected area. This area of involvement was not anatomically distinct, the distribution being as follows: right base alone in 16, left base in 13, right upper zone in 3, and both bases in only 1 case.

Unfortunately, complete pathological investigations were practically impossible. In six cases a bacteriological examination of the sputum was carried out. The organisms found varied; *Streptococcus viridans*, *Neisseria catarrhalis*, and haemolytic streptococci (two cases) were the most frequent. A chest radiograph was possible in only four cases during the period when the signs were present, and in none of them were there abnormal findings.

In all these patients the signs cleared completely, the time taken for this being from 2 to 28 days (average 10 days).

Treatment consisted of rest in bed until all signs had cleared. Apart from general measures, specific therapy was tried in 18 patients. "Sulphatriad" (15 g.) was used in seven, procaine penicillin (750,000 units daily) in four, chloramphenicol (9 g.) in six, and "aureomycin" in one. It was my impression that these antibiotics did not shorten the time taken for the signs to clear. In the later cases these drugs were not used and the results were equally satisfactory.

Case 1.—A housewife aged 50 suddenly felt unwell on December 26, 1950, with shivering, aching in limbs and back, and an irritating cough. She remained in bed for two days and then got up. She continued to feel ill, the cough became worse, with blood-stained sputum, and a dull pain had developed in the left lower chest. I first saw her on January 2, 1951 (she had been seen elsewhere on the day of onset). She did not look very ill; her temperature was 99.4° F. (37.4° C.), and pulse rate 72. Chest examination revealed fine inspiratory rales at the left base with diminished air entry but no alteration in the percussion note. She was treated with 750,000 units of procaine penicillin daily for six days. Fever subsided within three days, but signs did not clear until January 15. A radiograph of the chest on January 12 did not show any abnormalities.

Case 2.—A housewife aged 34 had a sudden onset of frontal headache, shivering, aching limbs, and cough on December 24, 1950. Symptoms persisted, and she was first seen on December 28, when, apart from general fever with a temperature of 102° F. (38.9° C.) and pulse rate of 98, there were no abnormal physical signs. On the 30th inspiratory rales with a diminished air entry were noted at the right base. She was treated with chloramphenicol, 0.5 g. six-hourly, receiving a total of 9 g. The fever gradually settled in four days, but the chest signs persisted for a total of 12 days. A chest radiograph in mid-February was normal.

Group 4: Signs of Pneumonic Consolidation

These were four previously fit patients in whom clinical signs of consolidation were found. The average age was higher in this group—being 56. The onset and the course of the illness were similar to those of the previous group, but the patients were much more severely ill and signs of consolidation were present. These signs appeared four or five days after the onset of the acute condition. A striking feature in this group was the more obvious response to antibiotics. The average time for signs to clear completely was 15 days, and all four patients recovered.

Case A.—A housewife aged 57, whilst nursing her husband with influenza, began to feel unwell, with weakness, cough, and "pains all over." She attempted to carry on her duties for a further three days, when she literally collapsed. When seen on January 21, 1951, she was extremely ill: her temperature was 103° F. (39.4° C.), pulse rate 125, and

respiratory rate 32. Alae nasi were working, but there was no cyanosis. She was mentally confused and disorientated. Chest examination showed signs of a classical left lower lobar pneumonia. In view of the severity of her condition she was given 750,000 units daily of procaine penicillin intramuscularly and 0.5 g. of chloramphenicol six-hourly, receiving a total of 12 g. She remained severely ill for 72 hours and then began to improve. Her temperature returned to normal in five days, and signs had all cleared by the twelfth day. A bacteriological examination of the sputum on January 23 showed *Str. haemolyticus* (Lancefield Group C).

Group 5: Fulminating Pneumonia

No such cases were seen in this particular series, but in previous epidemics, and elsewhere in this present one, they were encountered. This condition is often rapidly fatal and *Staphylococcus aureus* is often found in the lungs at necropsy (Stuart-Harris *et al.*, 1950; Scadding, 1937).

There were no other frequent complications other than those grouped above; but one man, aged 34, developed a left choroiditis which took three months to clear. He had had a similar history six years previously, also following influenza.

Discussion

An accurate diagnosis of influenza is difficult, particularly in sporadic cases. The diagnosis is most likely to be correct during epidemics. It is much easier to describe what is not influenza than what is, and in general practice a number of other common ailments have to be differentiated. As this series of cases occurred during a country-wide epidemic and the clinical picture was similar to that in previous epidemics, it is probable that the diagnosis was correct. I am also informed that cases conforming to all four groups described were examined elsewhere and presented serological and other evidence of infection by influenza A during the period January and February, 1951.

Particular attention was paid to the incidence of lung complications, and it was found that signs of definite lung involvement were present in 37 out of the 223 cases studied. This represents a 17% incidence. Bloomfield and Harrop (1919) found abnormal lung signs in 7% of 300 cases; Stuart-Harris *et al.* (1937) had an incidence of 28% in 120 cases; Scadding (1937) reported 69% in 58 cases; and Ogilvie, Mavor, and Weymes (1950) reported 10% out of 61 cases studied.

It is impossible to dogmatize on the pathological changes in human influenza, particularly so when, as in this case, there were no opportunities of studying the morbid anatomy.

Influenza is a generalized virus infection with predominant effects in the respiratory tract. The severity of the lung involvement varies in individual cases and in different epidemics. In this series the effects were mild and there were no fatal cases.

The grading of cases as attempted indicates an infection of the respiratory tract which reaches different descending levels. Thus Group 2 is probably a pharyngo-tracheitis. Group 3 presents an interesting pathological speculation. The signs—inspiratory rales accompanied by diminished air entry, which were present usually at one or other base—seem to indicate a parenchymatous infection falling short of actual consolidation, the actual pathological change being a "bronchiolitis" or "pneumonitis." This is in keeping with experimental findings in animals.

Straub (1937) found that influenza A virus, administered under anaesthesia, in mice and ferrets produced a necrosis of the epithelium of the finer bronchioles. There has been a good deal of discussion over the relative roles of virus and bacteria in producing lung lesions in influenza. It is interesting to note that in this series there was a more dramatic response to antibiotics in Group 4 cases, and, although there was a relatively small number of these, there was a suggestion that the beneficial response was due to the presence of a severe secondary antibiotic-sensitive bacterial infection. The lack of response in Group 3 cases might have been because the condition was a more predominantly virus infection which was insensitive to the antibiotic drugs used.

The relative rarity of classical lobar pneumonia in present-day general practice should be noted. In my practice only three cases of this condition have been met with in the past five years. During this same period some 40 cases of unilateral lung infection were seen, having the general picture of the cases described under Group 3.

Summary

A report is presented on 223 cases of clinical influenza seen during the epidemic of last winter.

Difficulties in accurate diagnosis are discussed and the clinical features of influenza described.

The incidence and type of lung involvement are discussed. Signs of lung involvement were found in 17% of the cases. The particular frequency of a "bronchiolitis" or "pneumonitis" is noted. There were no deaths. There was an absence of any real response to antibiotic drugs in this group, but a good effect was obtained in the four cases with pneumonic consolidation.

A correlation is attempted between pathological and clinical features and the relative roles of virus and bacteria.

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EFFECT OF CORTISONE ON REACTION OF SKIN TO ULTRA-VIOLET LIGHT

BY

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Recent investigations have revealed an increasing number of diseases the symptoms of which disappear or are ameliorated during the administration of cortisone in doses that are massive compared with the physiological hormone requirement. An explanation of the mechanism of this action has been sought in the rather basic changes produced in the organism. One of the central problems in this respect—the effects of cortisone on the reactivity of the organism when subjected to various stresses—still remains to a large degree unsolved.

With the use of an adjusted dose of radiant energy as a stress I have studied the change in reactivity caused by massive dosage of cortisone; the radiation was applied to a tissue (skin) in which its effects were easily observable. The results of such an experiment may be thought to be of general interest.

Material and Method

Experiments were made on 14 patients treated with massive doses of cortisone. (The preparation used was cortone acetate, or 11-dehydro-17-hydroxycorticosterone-21-acetate, produced by Merck and Co., Inc., U.S.A.) Nine of the patients suffered from rheumatoid arthritis, one from rheumatic fever, one from neurocirculatory asthenia, one from bronchial asthma, one from ulcerative colitis, and one was a suspected case of brain tumour. Eight of the patients were females and six were males. The average age was 41.5 years.

A mercury quartz lamp (2.5 amp., 220 volts) was the source of the radiant energy. The lamp was 19 cm. from the focus, and an opaque plate with five holes for the exposure was placed at this distance. (The diameter of the holes was 6 mm., and their centres were 15 mm. from each other.) In order to ensure that the amount of radiant energy would be constant, at every session the lamp was on for five minutes before the actual exposure. Thus the terminal radiation due to an increase in the temperature of the lamp may also be regarded as identical at the different sessions.

The volar surface of the forearm was selected for the exposure, using a different site each time, since it is known that the sensitivity of the skin to ultra-violet light is greatly reduced by previous exposure to it (Ellinger, 1932; Schulze, 1946). As the experiments were made during the period from December to February it can be assumed that, at the latitude of Helsinki, the sensitivity of the skin of hospital patients would not have been reduced by exposure to sunlight during the intervals between treatment. At the exposure the opaque plate with the holes was pressed against the site of the skin to be treated. The middle part of the forearm was chosen for the exposure during the administration of cortisone. Before and after its administration the exposure was directed on each side of this area (areas possibly less sensitive to radiation).

The duration of the exposure through the different holes was $\frac{1}{2}$, 1, 3, 6, and 6 to 20 minutes. After preliminary tests an attempt was made to adjust the length of the longest exposure in such a way that it would produce blister formation.

The reactions of the skin were read 6 and 24 hours after the exposure. Ellinger (1932) recommended a reading after 7 and 24 hours. Attention was paid: (a) to the shortest exposure which produced a visible reaction in the skin; (b) to colour changes at the site of the exposure—these were classified according to Schulze (1946), in three groups: (1) red erythema, (2) red erythema and brown pigment, and (3) brown pigment only; and (c) to blister formation at the site of the exposure and to the diameter of the blister.

Results

The results obtained are given in the Table. These show that the reactivity of the skin to radiant energy was on an average reduced during a massive dosage of cortisone. A protective reaction appeared in the skin only after a dose of radiant energy about twice