A HISTORY OF INFLUENZA AND ITS VARIATIONS

By

J. GORDON WILSON, M.B., Ch.B. (Univ. Glasg.)

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A HISTORY OF INFLUENZA AND ITS VARIATIONS.

I. A HISTORICAL SURVEY OF EPIDEMICS OF INFLUENZA WITH SPECIAL REFERENCE TO ITS GEOGRAPHICAL DISTRIBUTION.

II. ITS USUAL TYPES.

III. ITS VARIATIONS.

BIBLIOGRAPHY

Out of the voluminous literature on the subject, in its varied aspects (epidemiological, pathological, therapeutic, etc.), the following chief works, treatises, and publications have been found requisite for a comprehensive study of the great Influenza question, from the Historical as well as the Medical point of view. The names of authorities consulted are quoted generally throughout the text.

Leichtenstern, O. "Influenza" in Nothnagel's Practice. (1905).

Osler, W. Principles and Practice of Medicine, (1919).

Parsons, Franklin, Report on the Influenza Epidemic of 1889-90, and further Report on the Epidemic of 1892, (1893).

Thompson, E. Syme, "Influenza", 1890.

Hirsch, A. Geographical and Historical Pathology, (1883).

Creighton, C. A History of Epidemics in Britain, (1891).

Dixon, Epidemics of Influenza, 1892.

Goodhart, Sir James, "Influenza" in System of Medicine, Vol. 1: Allbutt and Rolleston. (1905).

Moore, Sir J. W. "Influenza" in Encyclopaedia Medica.

Finkler, D. "Influenza" in Twentieth Century Practice. Vol. 15. (1898).

The British Medical Journal, and the Lancet, 1918-20.

The Practitioner, (1907 and 1919).

Royal Society of Medicine: Discussion on "Influenza", (1918).

CHIEF ILLUSTRATIVE CASES

I. HISTORICAL SURVEY.

FORENOTE.

The résumé here set down is a development of the summary given by Thompson (Annals of Influenza for the years 1510 to 1837). Additional details for foreign countries and preceding and subsequent epidemics have been compiled from the works in the subjoined Bibliography. In the construction of the chronological survey, local epidemics, of recognizable magnitude and duration, have been given a place as well as the more widespread and noteworthy pandemics. So many epidemics of Influenza have, however, arisen e.g., during the nineteenth century, that only a passing note of their occurrence and distinctive features has been given. As far as the great pandemics are concerned, at least in the modern statistical period, nothing of importance has been omitted in making the record complete, except in the last and mightiest, whose trans-continental travels have yet to be traced in detail. It has been found convenient to include, with the primary geographical particulars of each visitation, the outstanding symptoms and, where possible, any special treatment adopted, as well as any coincident phenomena. In these later specifications no exhaustive discussion is aimed at. The following order has been observed for each epidemic tabulated:-

I. (a) Supposed place of origin.

(b) Course - the countries being arranged as far as possible in the order in which they were invaded.

(c) Geographical description.

II. Particular Symptoms.

III. Treatment employed.

IV. Meteorological phenomena.

V. Prevalence of other epidemic diseases, or of Epizootics, before, during, and after each visitation of Influenza.

Abbreviations:

Influenza - Inf.

Symptoms - Sympts.

Treatment - Treat.

Coincident Phenomena - Coin. Phen.

DEFINITION: While a definition would need to be extremely wide to cover all cases which are accepted as cases of Inf., it may be said to be: "An acute specific infectious disease characterised by fever, by symptoms affecting mainly the respiratory, nervous, and digestive systems, and by prolonged prostration following upon defervescence." (Jack).

CAUSATION: While in the light of present knowledge, the Bacillus Influenzae of Pfeiffer, one of the smallest bacilli known, still holds the field as the chief exciting cause, it

is apparently due in a certain proportion of cases to pathogenic organisms in symbiosis, several of which can be cultivated from the sputa and some from the blood and the urine. The disease is "always present in urban communities, wide-spread epidemics of it only occurring when a more exalted strain of the same virus is introduced from without."

ANTIQUITY: The elusive and protean disease now so well-known as "Influenza" was familiar to physicians from remote antiquity as an infectious febrile disorder. Reference made to it in the works of the ancient physicians, and accurate descriptions given by medical authorities during the last three centuries, tally so substantially in their narration of the phenomena and course of the disease, that no chronological history of its visitations can be regarded as complete that does not extend over at least seven hundred years.

Inf. has in all times been "regarded as fulfilling all the conditions of an epidemic in its sudden invasion and rapid and extensive spread." Indeed it has on occasion, with the doubtful exception of plague and cholera, travelled further and more rapidly over the world than any other recognised disease. It is, however, a matter of greatest difficulty in the older records, even of trustworthy chroniclers, properly to differentiate between the various diseases as set forth in such documents for the following reasons:-

(a) The early annals of epidemics are generally scanty and deficient in detail, or couched in vague and obscure terms which might refer equally to such diseases - also recognisable in severe outbreaks - as plague or cholera, or those in which the more striking symptoms are similar, as ague or catarrh.

(b) The features presented by Inf. have been found to vary in the different localities visited and persons affected to such an extent that forms of the malady might well be overlooked or mis-identified; while conversely, Inf. might easily be assumed where substantial foundation for the assumption is lacking.

To illustrate: on turning to modern times - in the latest pandemic "so large has been the proportion of atypical and modified attacks that it has been found difficult to diagnose Inf. from Trench or Louse Fever where the latter is unaccompanied by relapses." (Debate of the Royal Society of Medicine). It is not surprising, then, to find that there exists a wide difference of opinion (even amongst reliable authorities who are in accord on most other points) as to what epidemics should be considered outbreaks of Inf., and also as to the date on which the first clearly recognisable epidemic of Inf. was recorded. Zeviani dates the authentic history of the disease from 1239, Glüge from 1323, Schweich and others 1387, while Zulzer, Thompson, and others are still more reserved and put it as late as 1510. Hirsch, the eminent authority upon whose work all modern research in the history of Inf. is based, gives it as his opinion that the earliest verifiable account is in A.D. 1173, but considers that "the disease may be followed into the remotest periods for which we have any epidemiological record at all."

It is at least conclusive that from antiquity this multifarious disease was common, and that only when the occult causes of its pandemicity can be discovered by medical science and their action averted, will it cease to be regarded as one of Nature's cataclysms, and as a relentless, mysterious, and

overwhelming scourge.

B.C. 1184: Though no more than a glimpse of what may have been Inf. in the remote past, and at best inconclusive so far as the exact nature of the disease is concerned, a description is given by Homer of an outbreak (in the tenth year of the siege of Troy) in the Grecian Camp, which assumed the dimensions of an epidemic in nine days but soon passed off. Thousands of warriors were said to be destroyed. Mules and dogs also suffered as in the epidemic of 1775. (Glass).

B.C. 412: Hippocrates (Epidem. lib. VI. sect. VII.) gives an account of an outbreak of Inf. in Perinthus. It broke out in winter about the solstice and was preceded by great changes of the winds. (Schnurrer).

Sympts: Great tendency to relapses; complicated by pulmonary affections, nyctalopia, angina, paralyses, etc., such complications always occurring in the relapses. The member most exposed to fatigue was the part most liable to attack. Women were less liable and had milder attacks. Sometimes fatal, especially when a febrile rigor supervened.

Treat: Purging, venesection, bleeding by ranal vein, emetics. None any good.

Livy (Lib. IV. C. XII.) briefly describes in the same year at Rome a characteristic Inf. epidemic with great morbidity but relatively small mortality.

Passages from Thucydides have also rightly been connected

with the disease.

The terrible Camp-pestilences described by Diodorus (B.C. 393) and Procopius (A.D. 542) are more suggestive of Smallpox, Typhus, and Bubonic Plague.

A.D. 591-2: An epidemic of Inf. appears to have visited at this time the towns of Nîmes and Tours (Leupoldt) the sympts. being pain in the head, sneezing, and intolerable yawning. It was often fatal. Coincidently an epizootic broke out among cattle and beasts of burden.

From the sixth to the tenth century epidemics arose, characterised by fever, cough, and other catarrhal symptoms; but these are not considered to be conclusively characteristic, recorded as they frequently were by a single individual and he without medical knowledge. It is, however, not improbable that the epidemics, A.D. 827 (France and Germany), 876 (Italy), 889 (Germany), and 927 (France and Germany) were Inf.

1173: Italy, France, England, Germany - "the whole German kingdom, especially Cisalpine Gaul." In Italy (Feb:) it was preceded by a dense fog. Many died, especially pregnant women. In England "a certain evil and unheard-of cough" affecting everyone and proving fatal to many. In Germany (Dec:) both young and old were affected. Here, as elsewhere, a very severe cough was described, from which many died.

1323: Italy and France. Notably at Florence (Aug.). "A pestilential wind."

1323-28: Italy and Ireland(March). There is evidence to show that similar outbreaks were prevalent in other countries

at the time: "An infectious fever caused by cold". Few died of it.

1387: Florence (Jan. and Feb.). France and Germany in a northerly direction (during Lent).

Sympts: From four to five days patients suffered from catarrhal symptoms - coryza, cough, severe headache, feeling of oppression in the chest - with fever and sometimes delirium. Hardly one in ten remained unaffected. The morbidity was, therefore, great but few succumbed, - chiefly the old and weaklings.

Treat: Decoctions of Chamomile and Coriander Berries, sweetened with Poppy syrup; Clysmata: Diaphoretics; low diet.

1403-4: Paris (April 1403), over 100,000 attacked. Nearly all business suspended. Flanders (April 1404), Saxony and Thuringia later on.

Sympts: Cough, headache, loss of appetite for both food and drink, insomnia and great prostration. Morbidity very great; not so the mortality.

Coin: Phen: "Animals suffered from the same disease."

1410-11: Paris. Over 100,000 cases.

Sympts: Disturbances of taste and smell, insomnia, febrile attacks (two or three per diem), general malaise, violent cough (so severe as to bring about rupture and abortion). Epistaxis and melaena in convalescence, which sometimes lasted six weeks.

Coin. Phen: Epizootic among birds, attributed by physicians to a "general contamination of the atmosphere."

1413-14: 1413: outbreak in Paris lasting for three months.

1414: Bologna (Jan.); Paris (Feb.); Russia is said to have been visited this year. Almost universal where prevalent. The Law Courts, Universities and other institutions had to be closed. Over 100,000 persons were attacked in Feb. and March.

Sympts: Headaches, loss of sleep, pain in kidneys and limbs. Fatal only in very old people.

Coin. Phen: A North wind prevailed.

1427: Paris, about the time of the Festival of Saint Remigius. St. Aubyns (England) in October.

Sympts: Anorexia, insomnia; began with pain in the region of the kidneys, as in an attack of gravel. Sermons had to be abandoned through the coughing and sneezing, but theatres seem to have remained open! An unknown chronicler at St. Albans writes: "In the beginning of Oct. a certain rheumy infirmity which is called 'Mure' (murrain?) invaded the whole people, and so infected the aged along with the younger that it conducted a great number to the grave." Apparently a sudden and dangerous attacking of the masses.

Coin. Phen: In the preceding year - a comet. The winter was so mild that "everything was in blossom."

1510: The first real pandemic of the disease occurred in this year, when it was generally distributed throughout Europe. No mention of its incidence in this country appears, except in a foreign account. Creighton suggests that the ill-health of Erasmus (attributed by him - in a letter from Queen's College, Cambridge in Aug. 1511 - to a sweat) was very likely consequent to an attack of Inf. in the previous year. The disease appeared

to spread northwards from the shores of the Mediterranean - direction generally S.E. to N.W. Malta, Sicily, Italy, Spain, Portugal, France, Germany, Holland, Britain, Hungary.

Sympts: Added to the ordinary sympts., violent pain over the eye, delirium, gastrodynia. Sometimes from the seventh to the eleventh day syncope, intense muscular pains, subsultus tendinum. Diarrhoea and sweating on the decline. Though scarcely an individual escaped the disease (Masses could not be sung) the deaths from it were few.

Treat: Gargles, lozenges, decoctions - in Germany a decoction of Wolfram, treacle, benzoar, and camphor was much used. Five blisters (two to the arms, two to the legs or feet, one to the occiput). Bleeding and purgatives said to be injurious.

Coin. Phen: The epidemic was preceded by a long continuance of moisture and followed by remarkable storms; Signacula (or "blood-spots", supposed to be microscopical fungi) on linen and food; "blood-rain"; great swarms of locusts in Seville. In 1507, 1508, and 1510 great devastation by caterpillars in Germany; murrain among cattle at Meissen. Eruption of Vesuvius, and appearance of Comet preceded epidemic. Eruption of Hecla; meteorites and earthquakes followed it. In the next year - a Comet.

1557: Statements as to direction contradictory. Supposed course Westerly, from Asia to Constantinople, then to Sicily and then towards the North:- Italy, Switzerland, France, Spain, Holland, Britain, and N. America. (Note: Hirsch gives 1627 as

the date of the first epidemic in the Western hemisphere). The Sittings of the Paris Law Courts had to be suspended through it. That this country was also included in the area affected is evident, for Creighton quotes a contemporary writer, Wriothisley, in the statement that in 1557:- "This summer reigned in England divers strange and new sicknesses, taking men and women in their heads; as strange agues and fevers whereof many died". Stowe records in his Annales that in the harvest of 1558 "quartan agues continued in like manner, or more vehemently than they had done the last year passed, where-through died many old people and specially priests, so that a great number of parishes were unserved, and no curates were to be gotten, and much corn was lost in the fields for lack of workmen and labourers". (Practitioner).

Sympts: Much the same as in 1510. Occasionally pleurisy and fatal peri-pneumony. There was severe pain at the side relieved by bleeding if early adopted. On the decline, laxatives gave good results. The disease spared neither age nor sex; often women aborted; but as a rule only children, consumptives, the debilitated, and drunkards succumbed.

Coin. Phen: Preceded by thick ill-smelling fogs and followed by excessive rains and great inundations. In the spring measles and smallpox, followed by purpura, rife among children in Padua when Inf. suddenly broke out. In England there was great dearth in consequence of the wet season which preceded the harvest, and the disease commenced in October, after a month of unusually cold winds. A Comet. The previous

year an eruption of Etna. In 1561 the Plague.

1562: General diffusion over Italy. Also appeared in Scotland. At this time it seems to have gone under various names, most of them indicative of novelty, e.g., "the new ague" and (with a touch of irony!)"the new delight", "the jolly rant", and "the gentle correction". In Edinburgh, where fashionable drollery dubbed it "the newe acquayntance", Mary Queen of Scots and all her Court fell victims to the prevailing malady (Vide letter by Randolph, Elizabeth's Ambassador, to Cecil in Nov.).

Sympts: Those of a mild epidemic. Few deaths. Chiefly old people. Headaches, severe coughing and pains in the chest.

1580: At first a general distribution over the Orient, then Constantinople and N. Africa. In Europe the general trend was from E. to W. and from S. to N. From Constantinople to Venice, Sicily, Italy, France, (nine to ten months), Spain (whole year) Portugal, Hungary, Bohemia, Germany, Holland, Belgium, England (October). Denmark, Sweden, Russia (Dec.). In the general diffusion over Europe millions were attacked within the space of from five to six months; whole communities in the course of a few hours.

Sympts: Fever, often of intermittent type. Epistaxis, vigilence or somnolency; giddiness, resembling intoxication; otitis (first record); parotid swellings; affections of the bile-duct and bilious vomiting (hence the disease was called "catarrhus biliosus" by some). Altogether a complexus of symptoms with which no other early epidemic can compare. The attacks lasted generally four days, sometimes seven to nine,

or even fifteen days, and terminated with profuse sweating, diarrhoea, or great diuresis. Great weakness after recovery.

Treat: As in 1510. In Italy and Spain blood-letting was extensively practised with very fatal results, killing nine thousand in Rome (Schenkius), and depopulating Madrid and Barcelona (Villalba). Nearly all those who were bled, died. (Saillant). Wierus maintains that with the exception of persons suffering from chronic disease or "qui venesectione sunt" hardly one per thousand of those attacked died.

Coin. Phen: Weather on Continent very variable, intense heat alternating with unusual cold during the summer. In England the epidemic commenced in Oct. after a cold, dry wind, preceded by two or three years of a moist, rainy, southerly constitution. Earthquakes in Kent and Yorkshire. Remarkable meteors in November. Aurora seen on six occasions on the Continent.

Plague of insects; birds migrated prematurely; those accustomed to build in trees, built on the ground, or abandoned countries where the epidemic appeared. Cattle deserted their pastures, plague of mice, flight of owls, murrain among beasts in Kent; slight local epidemics of measles and scarlatina preceded on the Continent. In England measles and smallpox quickly followed. In 1583 dysentery. In 1584 plague.

Note: Creighton points out that these wide-spread volatile sicknesses of 1557-8 and 1580-2 grouped under Inf. were related in time to great epidemics of Bubonic Plague. These were, however, less noticeable in England than abroad. (Practitioner).

1591-1612: In these years, and indeed throughout the

seventeenth century, only very fragmentary reports concerning Inf. are obtainable. The fact that plague superceded Inf. during the greater part of the period 1580-1612 probably supplies a reason. Consequently only countries and dates can be given. 1591: Germany; 1593: Holland, France, Italy; 1597: Italy, Germany; 1610-12: "Catarrh and disorders of the breast over all Europe".

1626-27: Winter of 1626: Italy, and Germany; 1627: Spain; in the summer, N. America. It is believed to have spread to the W. Indies and to S. America as far as Chili.

Sympts: In most respects similar to the 1510 pandemic, but a new symptom - inflammation of the pharynx and tonsils - was frequently observed.

Coin. Phen: An earthquake at Naples.

1647: Note: Holland, which had then a trans-atlantic trading connection, is said to have been visited by Inf. in 1642-43.

First epidemic in the Western hemisphere to be mentioned in American annals (Webster, Noah: "A Brief History of Epidemic Diseases, 1799"). Also visited the W. Indies. Barbadoes and St. Kitt's are said to have lost 5-6,000 inhabitants apiece.

Sympts: Fever, coryza, pulmonary complications.

Treat: "Such as were bled or used cooling drinks, died; such as made use of cordials and more strengthening things, recovered". (Webster).

Coin. Phen: Violent earthquakes in S. America.

1657-58: Note: Hirsch records an outbreak in the New England States in 1655.

General direction from E. to W. 1657: raged in Switzerland; Pomerania. 1658: Italy (Jan.); France, England, (end of April to end of May). "The third part of mankind almost distempered within the space of one month". (Willis).

Sympts: Epistaxis, violent headaches, severe vomiting, haemoptysis, often dysenteric affections, attacks of sweating at nights.

Coin. Phen: More snow fell in Rome during Feb. 1658 than in the whole previous century. A winterly spring in England and Germany, and in Germany a North wind prevailed from March to the end of June. The previous summer had been exceptionally hot. In the summer a new fever affecting "the brain and nervous stock" (Encephalitis?) recorded in England. Willis depicts three consecutive epidemics - autumn, 1657; spring, 1658; autumn, 1658; the middle epidemic of the three being Inf.

1675: Accounts as to direction hopelessly conflicting. September: Germany, France; October: Austria, Hungary, England. Sydenham mentions that the following year there were excessive deaths (apart from smallpox) pointing to the occurrence of a second and more severe wave. A lesser epidemic, also, in 1679.

Sympts: Pleurisies and Pneumonias supervened, but in England sympts: those of pleuritic fever rather than pleurisy; bilious derangements. In Vienna, haemoptysis; in France, a violent cough, very fatal to pregnant women, of whom many aborted. In Germany, cough and dyspnoea. Evelyn, in Oct., enters in his diary: "I got an extreme cold, such as was afterwards so epidemical as not only to afflict us in this island,

but was rife all over Europe like a plague." The epidemic spared hardly any one of whatever age or temperament. It went through whole families at once.

Coin. Phen: In England a hot summer followed by thick, pungent autumnal fogs, moist and cold, preceded. In Hungary it rained practically the whole summer, which in Germany also was very damp. An eruption of Etna. Smallpox followed in England, and in 1677 dysentery.

1688: Said to have spread all over Europe from E. to W. May - London: July - Dublin, where it was designated "a short fever."

Sympts: So slight that patients only ill "for two or three days except they were let blood." Very many people suffered, but the disease was rarely fatal - about one in a thousand cases.

Coin. Phen: A hot summer after the severe winter. Earthquakes. An eruption of Vesuvius.

It was generally preceded in England and Ireland by a distemper attended with nasal defluxion (probably glanders) among horses. At the Curragh, where the army of Ireland was encamped, not ten horses in a regiment escaped.

1693: The direction appears to have been from W. to E. in this year. Oct.- England; Nov.- Ireland; from England to the North of France, Flanders, and Holland.

Sympts: Violent cough, immoderate salivation, great defluxion from nose and eyes, high fever, severe headache, photophobia. The disease was not attended with many fatal

results, usually terminating in a critical diaphoresis without any treatment.

Coin. Phen: Autumn suddenly intensely cold after moderately warm weather for the season. Great earthquake in Sicily following a severe eruption of Etna.

1709-12: Probably a single period of epidemics of wide distribution without particular direction. Brought by disbanded soldiers to England from France and the Low Countries (cf. pandemic 1918-19). 1709: Italy, France, Belgium, Germany, Denmark; 1710: England; 1711: Dublin; 1712: Denmark, Germany, Italy.

Sympts: Chest complaints and rheumatoid troubles; pulse, hard; Urine, highly-coloured with much sediment. Germany: Exacerbation of usual symptoms at night. Berlin: often an eruption like nettle rash, petechiae of dark cinnamon hue; Tübingen: great drowsiness, from which it was called "the Sleeping Sickness". (A type much noticed in pandemic, 1918-19). England, severe cough, quick pulse, headache. Mortality very low.

Treat: Bed, diet, laxatives, diaphoretics, expectorants.

Coin. Phen: Winter of 1708-9 extremely cold. In England epidemic was preceded by a Comet and by long continued intense frost. In 1712, many earthquakes, eruption of Vesuvius and, in Saxony, "a stinking fog". Aurora three times. Plague broke out in 1711.

1729-30: First reported invasion from Russia. "Spread like a hurricane all over Europe." Direction from E. to W.

1729: April - Russia, Sweden, Poland; Nov.- Germany, Austria, Hungary, England; Dec.- Switzerland; 1730: Jan.- Italy, France; March - Spain, Iceland (first well-authenticated epidemic) and possibly America.

Sympts: England:- Anorexia, rheumatic pains. Many complications reported from abroad - pleurisy, pneumónia, convulsions, delirium, otitis.

Treat: Emetics, diaphoretics, laxatives. Opium and astringents for diarrhoea. Venesection where lungs and brain implicated, but, as a rule, blood-letting and purgation injurious.

Coin. Phen: In Europe, summer cold and rainy, except in Italy, where terrible thunder-storms caused great panics in Switzerland. Volcanic eruptions. Fog of sulphurous odour in Italy. Earthquakes, meteors. On Nov. 16th and 17th, 1729 (Nov. having been rainy with high tides) an Aurora seen over the whole of Europe. In Austria and Hungary, the epidemic was preceded by an epizootic.

1732-33: General diffusion over the whole globe from E. to W. (Hirsch). Second invasion from Russia. 1732: Nov.- Russia, Poland, Germany, Holland; Dec.- England, and Scotland. In 1733 it is supposed to have taken two directions:-

(a) Switzerland, France, Italy, Spain, Majorca, Mauritius.

(b) Crossed Atlantic to New England, all N. America, and thence to Jamaica, Barbadoes, Mexico, and Chili.

Note: In this country its spread appears to have been slow. At Edinburgh in Nov., in Cornwall not till the following February.

Sympts: Sanguineous discharge frequent from nose, lungs,

and bowel; bilious derangements; occasionally swellings of the parotid, testes, and salivary glands. Milaria, petechiae, herpes labialis.

Coin. Phen: Dry, Southerly winds; wet, Northerly winds. Volcanic eruptions. Vivid Aurora Borealis (127 observations recorded). A Comet. Arctia phaeorrhoea (a moth) destroyed leaves of elms, oaks, whitethorn hedges, fruit trees (also the fruit) and occasioned general alarm (France). At the decline of the disease a remarkable meteor exploded in the air. A foetid fog. Measles previously epidemic; subsequently cholera and diarrhoea; much nervous disorder, pain in the head and delirium without fever. Coin: cough and other diseases among horses. In 1735 Inf. in Ireland.

1737-38: Exact course unknown. 1737: June - Saxony, and Thuringia; Nov.- England; Dec.- N. America and W. Indies. 1738: Jan.- diffusion over France.

Sympts: Bilious derangements; affection of salivary glands; rheumatic pains, toothache, hemicrania, insomnia, delirium - in some cases even to mania. Petechiae. On the decline collapse, sweating, constipation or diarrhoea.

Coin. Phen: Eruption of Vesuvius, earthquakes. A Comet. Remarkable meteors. Much disease among horses. Lumbago. After decline of epidemic, nervous fevers, apoplexy, and palsy prevalent.

1742-43: Third invasion from Russia. Spread from coasts of the Baltic. 1742: Jan.-Feb.- Germany; Autumn - Switzerland and Italy. 1743: Feb.- France; April - England, and the

Netherlands. By May, the major part of the Continent.

Note: The names "Grippe" and "Influenza" came into use in this epidemic, replacing the plethora of names, medical and popular, formerly in acceptation.

Sympts: Lassitude; shivering; pain in head, limbs, and back; loss of taste and appetite; inflamed eyes; epistaxis; pneumonia with great dyspnoea (cf. pandemic, 1918-19, Secs. II and III.) and sanguineous sputum. At the decline often diarrhoea; purpura and pustules; subsequently dysentery and worms prevalent. Also cerebral apoplexy (first record).

Treat: Bleeding and emetics useful in some pulmonary complications, but venesection caused many deaths in Italy, as in previous epidemics.

Coin. Phen: In 1741-2 Smallpox, measles, and whooping-cough in England. There were Inf. epidemics of a local character in Germany in 1745 and in France in 1753.

Aurora Borealis frequent (observed 23 times during the two years); sound as of soldiers fighting in the air.

Note: The Shetlanders during the prevalence of the Aurora refer to it as the "dancing of the Merry Folk", the acoustics being much more remarkable than the spectacle).

Great atmospheric vicissitudes. End of 1742 very cold; beginning of 1743 mild, but followed by cold till May. Very severe Easterly winds in England for months before the visitation. Earthquakes; a Comet; and a "stinking fog". The previous year a remarkable fruit crop. Mange, glanders, and cough among horses; Haematuria among cattle.

1757-58: 1757: Sept.- general in N. America. 1758: France, Scotland, Yorkshire. Irregular in its course. Though the

epidemic first arose in N. America and thence appeared to spread to Europe, a connection between the epidemics in the two hemispheres is not clearly established. Universal in Scotland. In Edinburgh "not one of six or seven escaped".

Sympts: In America, rheumatoid. In France, colic, diarrhoea pains in the jaws; pneumonia. The most characteristic symptom in Scotland was a sensation of tracheal excoriation. Profuse epistaxis not infrequent.

Treat: Emetics and diaphoretics unstintingly praised.

Coin. Phen: Great heat in America. In Scotland an unusual prevalence of Easterly winds, but sky clear. Previously much dysentery and a bad kind of smallpox. Bostrichos typographicus (a bark-beetle) very destructive.

1759: Senegal and the Swedish army.

Sympts: Catarrhal. Followed among the Swedish soldiers by swelling of the feet, calves, and thighs.

Coin. Phen: Earthquakes, meteors, Halley's Comet. A catarrhal fever among horses. The Bostrichos typographicus very destructive.

1761-62: Authorities differ as to origin and cause. 1761: N. America during winter and spring, becoming widely diffused in America; Barbadoes and W. Indies in May. 1762: Germany, Austria, Hungary, Denmark, Ireland (May), Italy, British Mediterranean Fleet (July), England (Sept.).

Sympts: Much the same in America and England: affection of head, harassing cough and pain under sternum; pains in limbs; bilious derangement; crisis by perspiration.

Treat: Laxatives and sudorifics useful; strong purgatives injurious. In America generally the disease benign, but fatality entirely different in different places.

Coin. Phen: Uncommon vicissitudes of heat and cold. Meteors, sun-spots, Aurora Borealis, a Comet. Etna restless (an eruption in 1763). Bostrichos typographicus and Charaeas graminis (antler moth) very destructive. 1762 long called a "wormy year" on account of the great destruction done by caterpillars. Subsequently dysentery prevailed and bilious fevers.

1767: Wide diffusion over N. America and Europe, Germany, England (June and July), France, Italy, Spain. Re-appeared in Normandy, 1769, and N. America, 1772. An epidemic of Inf. also reported to have occurred at Cayenne in spring of 1767, in which more blacks than whites were attacked.

Sympts: and Treat: Lassitude, anorexia, fever. Venesection and purgation strongly condemned in France.

Coin. Phen: Preceding spring in England cold and foggy. An eruption of Vesuvius.

1775-76: Spring - Germany; Summer - Austria; Autumn - France, England, Ireland, Italy; Winter - France, England.

Sympts: England: two types:-

(a) A sudden giddiness and pain of head.

(b) Nausea and intestinal disturbances; jaundice (Vienna); pains in loins and side, cramps, prurigo, erysipelas; pustules.

This epidemic was followed by diarrhoea.

Treat: Much diversity of opinion as to the value of blood-letting, blistering, purgation. Camphor, quinine, and

opium praised by some.

Coin. Phen: In Germany, generally warm and dry after a very cold winter. In other parts of the Continent and in England, the epidemic was preceded by sudden changes of temperature and thick noisome fogs. Earthquakes and volcanic eruptions. In England and France there was a coincident epizootic among well-kept horses and dogs, characterised by anorexia, cough, and much weakness.

1781-82: Probably one of the most widely diffused visitations recorded - a decided pandemic. First appeared in India, where it is said to have attacked the British Army while it was besieging Negapatan in Nov. 1781. In China during the same autumn. Appeared at sea between Malacca and Canton and travelled Westward. Dec.- E. Siberia on the Chinese frontier; Jan.- Russia, then generally over the Eastern hemisphere. 1782: Feb.- Finland, Germany; April - Denmark, Holland, Sweden; May - England, Scotland; June - France, Italy; Aug.- Spain. In 1782 the Fleets of Admiral Kempenfelt and Lord Howe were obliged to return to England in consequence of Inf. attacking the crews when at sea to such an extent as to disable them temporarily from service. Ambulatory cases and other unwitting "carriers" from Portsmouth (where Inf. was then prevalent) probably provided the source of infection.

Sympts: Languor, loss of smell and taste. Sensation of contusion of limbs, puffiness, and redness of cheeks, and spreness of cheek-bones; pain of chest and sides; sometimes vomiting, jaundice, and bilious stools. Occasionally delirium;

sometimes diarrhoea; abortion. Although the disease itself was not dangerous, it was noticed to have a marked tendency to raise the death rate in some cities. The mortality of the next year was higher (secondary wave?).

Coin. Phen: In 1781 summer very dry; autumn very rainy; winter changeable; spring of 1782 remarkably late, then gloomy, cold, humid, with occasional dry fogs and peculiar storms. An eruption of Hecla. The Brown-tail moth and Bostrichos typographicus very destructive.

1788. Accounts of this epidemic meagre. Direction E. to W. spreading more rapidly to the latter than to the South. Russia, Poland, Hungary, Austria, Denmark, England (June); Scotland, France, Italy, and Switzerland (Oct.).

Sympts: Pain in epigastrium, sometimes running up whole length of sternum. Pain in ears and eyes. Toothache, orchitis.

Coin. Phen: Weather over the whole Continent very changeable. Severe gales and hail-storms. Meteors. A Comet.

1789-90: A most pronounced pandemic period if linked up with the 1788 outbreak. General diffusion over the Western hemisphere. 1789: Sept.- Oct.- Nov.- States of the Union; Oct.- and Nov.- W. Indies; Dec.- Nova Scotia and S. America. 1790: N. America.

Sympts: Violent pain in back and limbs, sometimes headache, pain in chest, peripneumonic affection. On the decline, moderate sweating. Children under eight generally escaped, but few adults immune. Bills of mortality enlarged owing to deaths among the aged.

Treat: Emetics and blisters found very useful; bleeding seldom resorted to.

Coin. Phen: The summer preceding the autumn outbreak remarkably hot. The last winter uncommonly mild and rainy.

1799-1803: A long period consisting of several invasions and outbreaks of the disease. 1799: Oct.- Russia; 1800: Jan.- Galicia; Feb.- Poland, Germany; May - Denmark; Sept.- China; Oct.- France; Dec.- Germany. 1801: Jan.- Brazil. 1802-3: winter - France; Jan.- Germany, Italy, Britain (spring and onwards, S. to N.), Switzerland.

Sympts: Considerable variation in type in these different visitations. Germany: much affection of the head; throat, chest, and intestinal troubles; sweating abundant and foetid. Children frequently died of convulsions. France: many complications, furious delirium, pneumonia. Italy: gastric form, delirium, petechiae. England: much bilious derangement and affection of head; epistaxis; often interchanging with scarlatina or superceding it; low fever subsequently prevalent. Preceded by epidemic diarrhoea.

Treat: Much the same as in former epidemic, but drastics shunned. Care as to emetics and narcotics. In Germany, a decoction of elder-berries and salt-petre said to be an unqualified success.

Coin. Phen: Sudden atmospheric changes. N. E. winds. Foetid, acrid fogs. Aurora Borealis. Earthquake shocks. Excessive mortality among insects and diseases of cattle and domestic animals very prevalent.

1804-6: 1804: Iceland. 1805-6: general in W. Indies; Spain, Russia, Germany, France, N. Italy.

Sympts: In France affections of the eyes and ears; angina membranosa; peripneumony.

Coin. Phen: Earthquakes, meteors, much disease among lower animals.

1807-8: General diffusion in Brazil. Localised outbreaks in England and Scotland during the winter of 1807-8.

1811-27: 1811: general in Brazil. 1815-16: general in N. America, Iceland, Brazil. 1826-27: widely spread over the Western hemisphere; severe in Siberia and E. Russia.

Sympts: Gastric, pulmonary, and rheumatic troubles. The epidemic of 1816 assumed a malignant form among children and was very fatal, killing in a few hours. 1827 (Russia) - intestinal troubles; vomiting; diarrhoea.

1830-32: A remarkably intense period of Inf., three vast rapidly consecutive epidemics, spreading over the entire globe. 1830: Jan.- China, Manilla, Polynesia; Oct.-Nov.- Russia. 1831: Jan.- Russia, Borneo, Java, Sumatra; Feb.- Baltic Provinces; March - Poland, E. Prussia, Silesia, and the rest of Germany, Austria; April - Finland; May - Denmark; June - Belgium, France, Sweden, Scotland, England, Isle of Mann, Switzerland, Burma, Singapore, India; July - Penang; Nov.- Italy, and U.S.A. 1832: Spain, Gibraltar, N. America.

Sympts: Much affection of the head and nervous system; loss of taste; soreness behind sternum.

Coin. Phen: Great vicissitudes in weather during its

passage from China, which took over twelve months. Preceded in France by cholera. A gradual transition to cholera is suggested in Britain. In England dysentery, concurrently and subsequently. Much disease among the lower animals, before, during, and after the epidemic.

1833-34: 1833: general diffusion over Western Asia, N. Africa, and Europe, travelling E. to W. Jan.- Russia; Feb.- Galicia, Germany; March - Egypt, Syria, Poland; April - Austria, Hungary, Denmark, France, Britain, Ireland; May - Italy; Sept.- Switzerland; Nov.- Sicily. 1834: Cayenne, Calcutta, Brazil.

Sympts: England: much nervous disturbance. France: angina, pleurisy, pneumonia, and other complications. Slow convalescence.

> Note: Contemporary writers on this epidemic called attention to the fact, now generally recognised, that the high mortality was due to complications and sequelae, not to the disease itself, however intense.

Concurrent disease among horses.

1836-7: This pandemic also rapidly encompassed the world. 1836: Oct.- Sydney; Nov.- Cape Town, Java, Penang, Further India. Dec.- E. to W. in Europe. Russia, Sweden, Denmark, Germany. 1837: Jan.- Egypt, Syria, Denmark, England, Ireland, France, Switzerland, Germany, Austria, Spain, Portugal; July - Faroë Isles, Mexico. In this year a primary outbreak can plainly be distinguished, commencing in the North and extending from E. to W., and a subsidiary one from the latter point, taking the direction from N. to S.

Sympts: Russia: mild fever, inflammation of throat, otalgia, pneumonia. Germany: eye troubles, palpitation, convulsions, paresis of facial muscles. England: much weight and pain of forehead, sometimes of vertex and occiput, soreness of sternum, discharge of tears, and acrid distillation from nostrils, severe backache. France: haematuria, pneumonia, great prostration during convalescence; in general, diarrhoea on the decline.

Coin. Phen: On the Continent cold, heat, dryness, and humidity alternated previous to the visitation of Inf. and somewhat similar conditions obtained in England.

> Note: In a letter written by Thomas Carlyle from London in Jan. 1837, the universality of its diffusion as well as the inclemency of the weather is recorded:- "A dirty, feverish kind of cold; very miserable and so general as was hardly ever seen. Printing offices, manufactories, tailor shops, and such like are struck silent, every second man lying sniftering in his respective place of abode . . . . . reek, mist, cold, wet, fogs: worse weather never fell from the lift."

Among cattle, sheep, and horses, both at home and abroad, there was much disease.

1838-47: During this period there were numerous more or less localised epidemics, except in the year 1840, which was free. 1838: Isle of Bourbon, Sydney, N. Zealand, Iceland. 1839: Abyssinia. 1841: Jan.- Germany; Mar.- Austria, Hungary; April - Dublin. 1843: spring - Belgium, England, France, Egypt, Chili; summer - U.S.A. 1844: Germany, England, France, Russia, Cayenne. 1845: Germany, Switzerland. 1846-47: England, Denmark, Belgium, Switzerland, France, Brazil.

1847-48: The direction not quite certain. After the

epidemic mentioned in the last paragraph, there was an outbreak of Inf. in Russia in March, and at Constantinople in August, but the general course of the real epidemic seems to have been as follows:- Sept.-Oct. - South of France; Nov.- Paris, Germany, Denmark, England, Scotland; Dec.- Germany, Switzerland, Greece, Egypt, Algiers. 1848: Jan.- Bavaria, S. of Italy, Spain, N. America.

Note: It is remarkable how late the epidemic reached Italy and Spain.

Sympts: Catarrhal form characteristic. Tracheitis, bronchitis (Capillary form very fatal), pleurisy. Erysipelas and rheumatism common as complications. Enteric symptoms frequent. In 1848, 7,963 deaths were directly attributable to Inf. in England and Wales.

Coin. Phen: In Russia great vicissitudes of temperature throughout 1847. Magnetic disturbances. Aurora eight times. Fogs and darkness.

1850-51: Epidemics in both hemispheres. 1850: W. Indies, S. America. 1851: Jan.- N. America and simultaneously in Austria, and Germany; Feb.- Sweden; March - France, Italy, Egypt.

1852: S. America, Australia. In the Antipodes an epidemic said to resemble Inf. - very fatal to dogs.

1853: Limited to Cape Colony.

1854: A few towns in Bavaria.

1855-58: 1855: Russia, Germany, Netherlands, Belgium, Italy, Brazil. 1856: Faroë Islands, Iceland. 1857: Central America, W. Indies, S. America, Canada, Russia, Germany,

Bohemia, Belgium, France. 1858: Italy, Greece.

Sympts: Abscesses of cervical and parotid glands, dropsical swellings of face, feet, and scrotum; epistaxis, bronchitis, pleurisy, pneumonia; on the decline profuse perspiration.

Note: This epidemic was very fatal in some places e.g., in Rome more people succumbed to Inf. than to cholera. In Brazil the epidemic prevailed only among the whites, while the blacks were not at all, and the mixed races only very rarely affected.

1860: June and July - Australia and Tasmania. Very fatal to old people.

1861: N. America in Dec.

1862: Jan.- Bermuda, Netherlands; April - Cape of Good Hope; May - Iceland (complicated with epidemic pneumonia).

1863-64: Winter - New Caledonia, France; Feb.- Switzerland; May - Algiers.

1866-68: 1866: March - France; May - England. 1867: Feb.- France; March - S. Germany; April - Belgium. 1868: limited to Turkey.

Sympts: A rash of the visible mucous membranes as in measles.

1870: Jan.- Russia; May - Denmark, Sweden, and a few German towns.

Sympts: Swelling and abscesses of glands of neck and groin; intercostal neuralgia.

1873: N. America. In 1872 there was a severe epidemic of so-called "Influenza of horses".

1874-5: Widely spread over both hemispheres during winter. America, Germany, Austria, France, N. Italy, Sweden.

1878-89: There were localised outbreaks in 1878 in East

Anglia, Denmark, and a few German towns. In America in the spring of 1879. In Würtzburg in 1883, and in Petrograd in 1885-88. In Greenland, Saskatchewan, Hudson Bay Territory, and Bokhara, in 1889.

1889-90: At the time the most important and extensive of all the pandemic outbreaks which visited the whole world. It was the first outbreak of importance in Britain for forty years. According to the exhaustive report drawn up by Parsons, the earliest appearances were observed in May, 1889, and three localities are mentioned as affected at practically the same time, all widely separated from eachother, viz., Bokhara, in Central Asia, (vide above), Athabasca in the N.W. Territories of Canada and Greenland. In the interior of Turkestan, the outbreak appears to have been extremely intense. During the summer it does not appear to have spread. It took four months to reach E. Russia, and five months to reach Petrograd (via W. Siberia and S. E. Russia). About the middle of Oct. it was reported at Tomsk in Siberia, and by the end of the month at Petrograd. During Nov. Russia became generally affected, and a few cases began to be noticed in Paris, Berlin, Vienna, and London. From Russia, the Baltic Provinces and Finland, it spread Westward like an avalanche over all Europe and along the Mediterranean to Egypt. By the beginning of Dec. it was general in Germany and Switzerland, but did not affect London till the latter half of Dec. Portsmouth was the first town in which its manifestations were observed. By the end of the year the whole of Europe was in the throes. Cases appeared

in New York and Boston about the same time as the disease became established in Britain. Here, as in Europe, it seems to have exhibited the same explosive character, when once fully under weigh. In Jan. the U.S.A. generally was affected, and thereafter the W. hemisphere was quickly involved, Canada, Mexico, Honolulu, the W. Indies, and Monte Video all within the month. During Jan. 1890 the epidemic reached its height in London, and appeared in a large number of towns throughout the British Isles, though it was less prevalent in the North and N.W. than in the South. Jan. witnessed a great extension of the disease in Germany, Holland, Switzerland, Austria-Hungary, Italy, Spain, and Portugal; but in Russia, Scandinavia, and France it was already declining. The period of greatest activity in Europe was the latter half of Jan., with the change of year for a central point. North and South Africa were almost simultaneously affected. In Feb. the provincial towns of England were most severely attacked, the death rate rising to 27.4, but in London it fell from 28.1 to 21.2, and for Europe generally the back of the epidemic was broken. At the same time, however, it appeared in Ceylon, Penang, China, Japan, Hong Kong, and India; also in West Africa, attacking Sierra Leone and Gambia in the middle of the month; and finally in the West, where Buenos Aires and Newfoundland were invaded. In March Inf. became widely epidemic in India (particularly Bengal and Bombay), and Borneo, and made its appearance in Australia and New Zealand. In April and May it was epidemic all over Australasia, in Central America, Brazil, Peru, Arabia,

and Burma. During the summer and autumn it reached a number of isolated islands, such as Iceland, St. Helena, Mauritius, and Réunion. By degrees all parts of the habitable globe were infected, the last appearances being towards the close of the year, when it was reported from Yun-nau in the interior of China, from the Shiré Highlands in Central Africa, Schoa, in Abyssinia, and Gilgit in the Highlands of Kashmir.

This pandemic, erratic though its course was, spread with a far greater rapidity than any of its predecessors. Within the short space of two months it almost circled the Northern hemisphere.

Note: Although seeming to out-strip the speed of human intercourse, it seems definite that nowhere was the rapidity of distribution greater than the rapidity of our most speedy means of transportation. Leichtenstern says: "In 1830-31 after first appearing in Moscow, it was eleven months in reaching Spain and N. America. In 1889-90 in the same period of time (approx.) the infection had covered the whole of the world, and extended up into the heights of the Hindu Kush range of mountains."

Sympts: In England, coryza was generally absent; prostration and nervous sequelae were varied and severe, though the complications principally involved the lung and stomach; bronchopneumonia was common and fatal; and rashes of various kinds, followed by desquamation of frequent occurrence. In the 1890 pandemic the incidence upon the ages 20-45 was relatively heavier than in 1847-48 (cf. 1918-19 pandemic).

Treat: General agreement as respects the advantage of refrigerants, diaphoretics, mild aperients, and diuretics, and considerable concurrence as regards the marked benefit derived from the early administration of emetics. Isolation and the

value of disinfection of the sputum and nasal secretions recognised.

Coin. Phen: Abnormally warm, moist weather for some months previously, with fogs during the active phase of the pandemic; lessened prevalence in London after strong gales.

Erysipelatous Inf. among horses was characterised by a marked involvement of the digestive tracts, by petechiae, erysipelatous swellings, conjunctivitis ("pink-eye"), grave nervous symptoms. There is no proof of this equine affection being transmissible as was alleged to dogs and to human beings. As in 1881 it was well-marked and severe.

1891-1917: The earlier outbreaks recorded in the last 25 years seem to have been of the nature of "trailers" or after-epidemics, "arising from the residual germs of the pandemic." The earliest signs of an epidemic revival on a large scale occurred in March, 1891, in the U.S.A. and the N. of England. It was reported from Chicago and other cities in the Central States, whence it spread Eastwards, reaching New York about the end of March. In England it began in Yorkshire (particularly Hull) and also independently in S. Wales. In London Inf. became epidemic for the second time about the end of April, and soon afterwards was widely distributed in England and Wales. The large towns in the North, together with London and Wales, suffered much more heavily in mortality than in the previous attack, but the S.W. of England, Scotland, and Ireland escaped with comparatively little sickness. The same might be said of the European Continent generally, except parts

of Russia, Scandinavia, and N. Germany. This second epidemic coincided with the spring and early summer; it had subsided in London at the end of June. During the third quarter of the year, while Europe was free, the Antipodes had their second attack, which was much more severe than the first. As in England, it reversed the previous order of things, beginning in the provinces and spreading thence to the capital towns. The last quarter of the year was signalised by another recrudescence in Europe which reached its height during the winter. All parts, including Great Britain, were severely affected. These two revivals were regarded as one, temporarily interrupted by the summer quarter. The recrudescence at the end of 1891 lasted through mid-winter, and in many parts (notably London and Brighton) only reached its height in Jan. 1892, subsiding slowly and irregularly in Feb. and March. Other parts of the world affected were W. Indies, Tunis, Egypt, Soudan, Cape Town, Teheran, Tong-King, and China. In August, 1892, Inf. was reported from Peru, and later in the year from various places in Europe. A fourth recrudescence, but of a milder character, occurred in Great Britain in the spring of 1893, and a fifth in the following winter, but the year 1894 had no epidemic except the one beginning in 1893. In 1895 another extensive epidemic took place. In 1896 there was a hiatus, and the Inf. epoch seemed past, but there was an increased prevalence of the disease in 1897, and again, on a larger scale, in 1898-99. In 1899, 12,417 deaths were recorded in England and Wales - the highest death-rate since 1892. After this the death-rate

declined by 50 per cent, and remained so, with but slight upward variations, till 1907, in which the total death-rate was 9,257. In other countries a similar state of affairs obtained; they were subjected to periodical revivals of epidemic Inf. at irregular intervals, and of varying intensity since 1889-90, but the general trend was a decline (by lysis) in its potency and activity. 1908-9 were marked by minor epidemics similar in course and duration and occurring about the same time of the year. They were "smarter" than for some previous years. 1913 and 1915 witnessed smaller epidemics in the metropolis - probably local or endemic epidemics: 1916-17 an increase of mortality with a relatively small epidemic, culminating in the last week of 1916. From this point an excessive pneumonia mortality, associated with fairly wide-spread prevalence of Inf. continued up to the 1918-19 pandemic - probably a genetic fore-runner.

Sympts: In these years the severity of the sympts. fluctuated, as did the actual incidence of the disease. The attack of 1891 was less sudden in its onset and gave rise to less sickness than that of 1890. The mortality, nevertheless, was higher in 1891, though far fewer were "down with Inf." Two theories as to the cause of this are given:-

(a) In the second attack, which was more protracted and more insidious, the stress of the disease fell more upon the lungs.

(b) Its comparative mildness, combined with the time of year, in itself proved dangerous, because it tempted people to disregard the illness, whereas in the first epidemic they were too ill to resist the marked virulence of the contagion.

In 1892 the mortality was nearly as high as in 1891, and for the two years succeeding there remained a very marked fatality. It has been stated that the inhabitants of Great Britain are less susceptible than those of many other countries, but in this epidemic, as in others, diminished efficiency seemed to evoke the trail of complications, which were the chief cause of the overwhelming death-rate, and these varied greatly in country and even in district.

Note: Statistics, even in these later years, would seem to have been blurred by the fallacy of regarding sporadic and epidemic Inf. as one and the same, whereas (to quote Leichtenstern) "the difference is as great and unmistakable as that between 'Asiatic Cholera' and 'Cholera Nostras'."

It is worthy of observation that in 1891 excessive mortality from both bronchitis and pneumonia was prolonged into the late spring, coincidently with a spring epidemic of Inf.

Treat: 20-30 drops of Liq. Opii Sed. given early found valuable in relieving pain and inducing deep and refreshing sleep. Pains of the first stage also relieved by Sodium Salicylate or, where headache severe, by Phenacetin. Quinine sometimes useful at this stage and convalescents did well on effervescing quinine. For insomnia - Ammonium bromide.

Coin. Phen: In 1915 100,000 died in Serbia of Typhus. Halley's Comet.

1918-19: Important not only as being a colossal pandemic, but, by reason of the excessive death-rate, unexampled both in distribution and severity. As in the last great pandemic of 1889-90, its world-wide spread has been "limited in its rapidity only by the speed of human travel and multiplying so rapidly

as to create the illusion of almost simultaneous origin in many countries" - civilized and barbarian alike.

Note: In attempting to trace the disastrous course of this pandemic, it is obvious that no record can be compiled till Army and Navy statistics and civilian statistics for many countries become available, and stated views may need revision as the result of further national and international information. The account of the geographical distribution is therefore limited, but it seems to have raged in every well-populated land, and to have held the whole world in its grip.

From the latest information (April 1920) the disease - though it has been generally held to have arisen in Spain - appears to have originated in China and Japan early in March, and to have broken out in Chicago and the United States military camps in April. Apparently it spread eastward and westward simultaneously. Assuming it to have issued from the East - though evidence on this point is inconclusive - Europe and America would seem to have been infected from a common source. The early outbreak among the Chinese Labour Corps in France is perhaps significant. (Vide Army Records).

A. Primary Wave. 1918: March - Spain; April - rapid and uniform distribution throughout Europe, with progressive infection in Spain; May - particularly wide-spread in Spain during this month. Very heavy incidence also among the Allied and enemy troops on the Western Front, where at outset it appeared to have "several different foci" and in the camps spread with great swiftness, obviously by direct contagion; June - further dissemination through France, Flanders, and Britain. Commenced in Egypt; July - the epidemic among the civil population in Great Britain reached its maximum in this

month. It was also very prevalent about this time in Italy and in a particularly severe form in Switzerland. By the end of the month it was causing excessive mortality, not only over all Europe, but in the U.S.A., Canada, the great cities of India, and elsewhere. This is the only recorded instance of a wide-spread epidemic culminating in the summer months (i.e., after June 23), epidemic peaks, according to Sir A. Newsholme, having always occurred in winter or spring. The increased virulence the same authority states to have been largely due to the monthly migrations of hundreds of thousands from America and the Colonies to England and France and back again.

In Spain, it was alleged by the French press in May, there were nearly eight million cases of "Spanish Plague". It at least points to an immense and sudden incidence.

In France it appeared first as a mild and transitory fever in May, and spread with gradually increasing virulence through the July epidemic, when pulmonary sympts. first appeared. The summer outbreak was, however, not associated with marked increase in the pneumonic death-rate, though there was the usual concurrent rise in deaths from bronchitis and pneumonia.

In Italy (when it first appeared towards the end of April, and increased till it reached its height at the end of May and the beginning of June) the first attacks were of a very mild type, but the later much graver owing to pulmonary, pleural, and cardiac manifestations. In the Italian army the sick rate in some divisions was as high as ninety per cent.

In Switzerland, though isolated cases occurred in June,

the great violence of the epidemic was not felt till mid-July. Severe and fatal cases were common, and the frequency among young persons was much greater than in the older generation. In some units of the Army three-fourths of the effectives fell sick. There were over five hundred fatal cases in the Army, and the civil population also suffered heavily.

B. A Second and more Serious Wave began in Sept. - the evolution of its cyclonic spread being much more rapid and more formidable than that of the Secondary in the early Nineties, or indeed any previously recorded Secondary wave, so that this early occurrence was unforecasted. It appears to have become serious a little earlier in Paris than in London. In all the great cities the hospitals were "crowded out" with Inf. cases. The incidence of Inf. was noted apparently in every country in Europe. Recent information brings to light the fact that Germany and Austria suffered severely during the early spring. The prison-camps in Germany were swept as by some hideous pest, so that huge pits had to be dug and holocausts kindled to get rid of the unnumbered dead. Civilian populations as well as the belligerent forces paid toll heavily - notably munition-workers and those concerned with the gigantic home and over-seas transportation. The mortality reached an unexampled maximum in North, West, and South Africa, India, and the North American continent. In Egypt, the maximum incidence was in the first two months of the second wave. In S. Africa it was estimated that about half the population was attacked, while over 7,000 Europeans and 40,000 natives died - mostly middle-

aged persons. It broke out in Durban in the end of August, but did not appear in Cape Town till the end of Sept. To illustrate the murderous severity of Inf., reports are to hand that fully one-seventh of the population of Papetee, Tahiti, died of Inf., the elder generation having been virtually wiped out; while it has also been estimated that in Mexico 432,000 deaths occurred from epidemic Inf. In the South Sea Islands it is reported to have wrought great havoc. Out of a population of 34,000, nearly 8,000 deaths occurred in Samoa, two-thirds of the victims being men, and the incidence among the natives being 80 per cent. There was also great loss of life in Tonga and Fiji. Mauritius also suffered.

In India, it developed as a wide-spread non-fatal disease in July and August. In the middle of Sept. the Bombay death-rate began to soar, and the second and major wave of Inf. that reached its crest in Oct. caused a havoc to which the Black Death of 1348-49 alone affords a parallel. Not fewer than 4,899,725 persons (about 2 per cent of the entire population) died of Inf. or its complications in British India, the vast majority within the space of two months. Making allowance for the Native States, not less than six million perished in India. In a few weeks, therefore, this wave destroyed more than half as many human beings as the dreaded Bubonic Plague killed off in twenty-two years. (From Report by the Sanitary Commission with the Government of India).

Note: It is suggested that the Indians have a lower resisting power to pneumonic infection, as the fatality rate for Indian troops was at least three times that found among British troops in India.

C. A Third Wave occurred in the spring of 1919, but of lesser severity and incidence and of a gradually diminishing type. Beginning in March, it flared up and passed through its phases speedily, and did not attain the height of its forerunner. The recrudescence was somewhat more marked in Italy and among the larger towns in Britain, a sharp upward fluctuation was observed. No adequate data have, however, yet been published. In the Far East, also, it appeared to be less severely felt. It seems reasonable to conclude that a natural immunisation was conferred, in India as in Europe, by the first two waves. The mortality of the third wave has been roughly calculated (in England and Wales) to have been 45 per cent (circa) of that experienced in the autumn. In London, the first wave destroyed some 1,750, the second about 16,000, and the third about 5,000 lives. (Dr. W. H. Hamer's Report to County Council, 1919.) These were all deaths, certified as caused by Inf. Of the excess mortality from other causes, much must have been due to the prevailing disease. In France, the Sept. outbreak had a mortality of 5 per cent, and this second wave did not subside till January. The fact that the third wave did not play havoc among the ranks of the Armies in France is conclusive that its force had abated. In India, no such frightful ravages as in the second wave occurred. As in the Nineties, the localities attacked - throughout the pandemic - seem in no case to have suffered severely for more than four to six weeks.

Sympts: Both in its epidemiological character and its

clinical picture, symptoms, varieties, complications, and sequelae, this last pandemic has proved identical with the Inf. of former centuries. The onset was often peculiarly sudden, the victim being struck with vertigo, weakness, and pain in various parts of the body suddenly whilst on duty or in the street, hence known as "Lightning flu.", and by the Germans as "Blitz-katarrh". This, however, is but a revival of a cant term "knock-me-down-fever," in use 3-400 years before.

Generally of the Respiratory type, fatal cases being due to broncho-pneumonia or acute bronchiolitis with increasing cyanosis. Inf. of the gastro-intestinal type was relatively common, and complications and sequelae comparatively rare. Sneezing, coughing, and expectoration common among slightly affected persons able to carry on their vocation. In a considerable proportion of cases there was persistent subnormal temperature. Worthy of note were the disproportion between the cyanosis and clinical signs and the later appearance of severe albuminuria; while, in the third epidemic, jaundice became an associated feature.

Treat: Universally it was found a matter of the greatest difficulty to prevent the domestic spread of the infection and well-nigh impossible to arrest the process of the disease by communal means, organised Public Health measures seeming powerless to resist the progress of pandemic Inf. In Norway, Denmark, and Switzerland, schools were closed, and theatres, cinemas, concerts, and shooting-matches suspended. The routine gargle of dilute Pot. Permanganate, Tr. Iodi, or Izal, and

the use of Formalin (in lozenges) employed, and in hospitals the wearing of the gauze mask round mouth and nose. Veils and respirators were adopted in parts of the Colonies and in America with questionable success, it being doubtful whether wearing a mask is a sufficient safeguard against a reputed "filter-passer". Prophylactic Vaccination was tried, and also vaccines and sera for severe toxaemic cases - but this line of treatment still sub judice. No evidence that venesection, combined with glucose and saline interstitially, intraveneously, or per rectum, relieved severe toxaemia. Adminstration of oxygen continuously through Haldane apparatus, or intermittently by open method, or subcutaneously, also of questionable merit where intense cyanosis. Heroic doses of Salicin sometimes met with success. Oil of Cinnamon (combined with Camphor or some Salt of Quinine), Creasote and a variety of other drugs proved generally futile. Bed, free purgation at the outset, hyper-ventilation and careful toilet of mouth and naso-pharynx of prime importance.

Coin. Phen: In India, failure of the monsoon caused a scarcity of food grains and especially of fodder, which was responsible for a dearth of milk. It has been contended that the world-shortage of food and improper substitution for formerly staple articles of diet lowered the national resisting-power. In all probability, environmental conditions such as bad ventilation, the gross overcrowding - at home and over-seas - and fuel shortage - due to war restrictions - were accessory factors in accounting for the excessive mortality, the chief

explanation being the accident of the season. In the light of past records, a relatively low mortality would be anticipated in a summer secondary wave, and a relatively high mortality in a winter secondary.

At the decline Stromboli was particularly active. Cuba became actively volcanic. Meteors in Canada.

Leichtenstern's general rule that "during the existence of great pestilences the other acute infectious diseases remain in the background" may be queried. Cholera was widely epidemic in Austria, Serbia, and Russia. In America the first epidemic followed measles and here empyema was a frequent complication. In Britain and France in 1918, measles was predominant. Largely distributed, also, were Cerebro-spinal fever, Poliomyelitis, Polio-encephalitis, and Encephalitis Lethargica - diseases for which Newsholme and Hamer suggest a common infective agency with Inf. and an actual close relationship with the disease.

An epizootic among monkeys and baboons reported in S. Africa. No signs of Inf. in the animals in the Monkey House of the London Zoological Gardens throughout the Inf. period.

EPIDEMIOLOGY.

General Characteristics: Of all epidemics Inf. is the most extensively diffused. It is "the world pestilence" κατ' ἐξοχην , or, as described by Huxham (1754) the "morbus omnium maxime epidemicus". It might further be asserted that no disease appears to spread so rapidly, or to attack almost simultaneously so large a proportion of the population exposed

to it. Its attack is not limited to particular nations or races of mankind, or to sex, and it is equally impartial to zone and climate e.g., Dengue, to which it bears some similarity, (vide differential diagnosis, Sect. II) ranges only over area 32° 47' N. and 23° 23' S. No such definite region can be allotted to Inf. It has been stated that Inf. is endemic in Northern Central Asia - "the elective point of origin of the Great Pandemics". Certainly almost all pandemics of former centuries have started from Russia in the autumn, winter, and spring months, travelling Westward from this region by the principal trade routes. The possible origin (vide p. 39) of the latest pandemic in Spain suggests the endemic prevalence of Inf. in Europe, especially in view of the fact that endemic Inf. is markedly seasonal, whereas pandemic Inf. is much less strikingly so. Leichtenstern says:

> "We know that Inf. presents at least two phases, one pandemic and the other endemic and they follow different epidemiological rules."

Although every epidemic of "La Grippe" begins and ends with isolated cases, it is by no means always easy to decide when an epidemic commenced and when it terminated. The average total duration of an epidemic in a district is not more than two to three months. The period, in which the greatest number of attacks occur, usually sets in two to three weeks after the first isolated cases, lasts three to four weeks and then subsides in a gradually diminishing number of "trailers" in another two to three weeks. As may be seen from the chronological summary, the Great Pandemics were usually followed at

longer or shorter intervals by after-epidemics, which most probably were recurrent waves of the original visitations. The geographical picture of these after-epidemics is disconnected.

Pandemics: As has already been seen, typical epidemics of Inf. have occurred from the twelfth century onward, sometimes in one quarter of the globe, sometimes in another, but with a relatively greater frequency in the Old World than in the New. Under certain circumstances, not as yet fully explained, epidemics, which are intermittent, have from time to time assumed the proportions of veritable pandemics. As such, may be reckoned the outbreaks of 1510, 1557, 1580, 1593, 1675, 1732-33, 1767, 1781-82, 1802-03, 1830-32, 1833, 1836-37, 1847-48, 1850-51, 1855, 1857-58, 1874-75, 1889-90, 1918-19. Many of these pandemics were not limited to the Eastern Hemisphere, but visited the Western as well, whilst others e.g., those of 1647, 1737-38, 1757-58, 1761-62, 1789-90, 1798, 1815-16, 1842, and 1873 - were entirely confined to the Western half of the globe. There is now a much greater tendency than hitherto to a wider geographical distribution of epidemic Inf.

Transmission: Inf. is chiefly transmitted by travelling Inf. patients, and convalescents; but "the possibility of communication of a disease by healthy persons and by merchandise (especially underwear, handkerchiefs, and in warm seasons perhaps by flies and other insects)" cannot be ignored, since so very large an area is infected in so short a time. Kant, considering the epidemics of 1781-82, in relation to Physical

Geography, expressed the opinion that:

> "The paths of communication between Europe and other parts of the world, by sea, and by caravan were the means of conveyance of many diseases."

History has proved him to be right, for the geographical distribution of the disease is largely dependent on the commercial intercourse of nations.

Wind-borne Infection: Hirsch remarked that the proven fact of pandemics progressing against the direction of prevailing winds was unfavourable to the hypothesis and no recent evidence is opposed to his conclusion, but Leichtenstern - himself an upholder of the "contagionistic creed" as against the formerly-accepted view of a miasma as a pathogenic agent which distributed itself through the air over vast territories, admits:

> "the aërodromic transmission of the germs to a certain extent through small distances from the place of an outbreak of the pestilence."

To quote the same gifted author:

> "beyond the specific germ and its communicability by way of contagion there are many conditions of whose influence we are still quite ignorant."

Climate, Meteorological conditions, Seasons: The fact that Inf. has prevailed in the moist climate of Scotland, the dry air of Egypt, in the cold of Russia, and the heat of India, shows that the disease is fairly independent of climatic influences, but it is not yet possible to say whether any special meteorological conditions are favourable or not to the dissemination of the malady. According to all records, the wind, both before and during many of the visitations, was so variable in

degree and direction as to suggest no suspicion that it had any particular effect, and in some instances the disease travelled contrary to the prevailing wind (vide above). Such atmospheric states as high barometric pressure, absence of precipitation, dryness of the air, fogs, sudden thaws, etc., cannot be held to account for the appearance and spread of the disease, and the temperature of the air seems equally without primary influence. "In 1580 the disease raged chiefly in a sultry season of the year: in 1762 and 1782 it prevailed during uncommonly steady weather; in 1830 it was general in Manilla with the thermometer varying from 78° to 90°, and in 1889-90 in Spain its advent was preceded by a month of cold, dry, and frosty weather, and at New York by the mildest, moistest season on record". (Parsons). There can scarcely, then, be any necessary connection between Inf. and states of weather; but meteorological disturbances are recorded in so large a majority of instances as to authorise a strong suspicion that some indirect relation does exist. In the words of Newsholme:

> "It is therefore still necessary to assume the action of some unknown influence, telluric, climatic, or other, which becomes operative under conditions of which we remain ignorant."

With regard to the seasons themselves and their connection with the dissemination of Inf. over the globe, we know that places in the North and South Hemispheres have been visited by epidemics at the self-same time i.e., at opposite seasons of the year; and Hirsch certainly states that Inf. is independent of them. On the other hand, Leichtenstern avers that:

> "Though the Pandemics in their storm-like course around the world were independent of wind and weather, climate and season, the origin of the primary Pandemics and the local Epidemics which followed were by no means entirely independent of season."

Practically all the many Pandemics, which at sundry periods arose in Russia, began, as has been seen, in the late autumn and winter months. Moreover, the Pandemic of 1889, the succeeding severe epidemics in East and North America in 1891 and 1894, and the latest Pandemic of 1918-19 occurred in the cold season, with the last solitary exception the summer remaining conspicuously free. Diseases of the respiratory tract are favoured by adverse atmospheric conditions and the primary origin of epidemic Inf. may possibly be in some way dependent on season. Finkler and others quote statistics as to the greater prevalence in winter than in autumn.

Periodicity: Some writers on the epidemiology of Inf. have entertained the notion that the disease reappears at regular intervals (Septennial periods, decades, etc.). Hagen, for example, pointed out that a period of a hundred years separated some of the earlier epidemics (1387, 1492, 1580), and he assumed like Most, pauses of twenty years between the epidemics of later date. The Chronological Survey, however, does not justify any such assumption, and it may safely be said that epidemics are intermittent, and that Inf. has never exhibited a tendency to real and sustained periodicity in either its epidemic or pandemic visitations. Greenwood, notwithstanding, remarks that periodicity in the strict sense of the word can only be disclosed by a somewhat elaborate

mathematical investigation, carried out upon long series of numerical data, and that:

> "Neither the technical method nor the suitable statistics were at the disposal of our predecessors." (B.M.J. Nov. 1918.)

Direction: Some authors, also, have ascribed a definite geographical direction to the spread of Inf. Most, Glüge, Haeser, and others were convinced that the epidemics prior to, and including, that of 1593 travelled from West to East, and all those of later date in the opposite direction. Unfortunately the records up to the year 1593 are so few in number, and so incomplete in detail, that it is impossible to decide the question so far as the earlier epidemics are concerned, and although the general direction of some of the later outbreaks seems to have been from East to West, or vice versa, all modern epidemiologists agree with Hirsch that Inf. does not travel in one direction alone, but spreads radially from a common centre and by leaps and bounds as well, whereby first one direction and then another prevails.

Spread by Human Intercourse: By following, for instance, the summary for 1889-90 on the map, it is easy to recognise that this epidemic travelled in its general dissemination by trade routes; and a careful study of all those records of past epidemics that contain a sufficiently detailed account of the progress of the disease, to enable one to trace its course, reveals the fact that whenever Inf. spreads over countries and hemispheres, as well as when it is limited to districts and localities, the direction it takes and the road

it follows are entirely determined by inter-communication. It is found also, as a rule, that, in each country attacked, isolated cases first occur in the capital, ports of entry, frontier towns, or commercial centres, according to the nature and extent of the means of communication between such places and foci of infection in countries previously invaded, and that the epidemic, as it spread over states, provinces, districts, and localities, appears earlier in towns tapped by the railroad than in the villages and scattered houses which surrounded them. Isolated communities - asylums, convents, prisons, - frequently escape, even though the disease rages in the vicinity; and in those cases in which the inmates of such institutions are attacked, the disease is without fail imparted by some individual who has visited an infected locality. Its extreme contagiousness renders it a very serious factor in transports, billets, camps, barracks, and hospital wards (this especially noteworthy in 1918-19).

Rapidity of Spread: Seeing that Inf. travels in its main diffusion along the chief lines of human intercourse, one would reasonably expect to find that the later epidemics had spread with much greater rapidity than those of earlier date. This has been demonstrated emphatically to be the case, as far as the epidemics of 1831-32 and 1889-90 are concerned, by comparison of the mensual dissemination of the two epidemics. The spread of Inf. by leaps and bounds, above mentioned, is due solely to irregularity of intercourse.

II. U S U A L T Y P E S.

Most modern physicians distinguish four main types of uncomplicated Influenza, viz:

I. SIMPLE FEBRILE.

II. CATARRHAL-RESPIRATORY.

III. NERVOUS.

IV. GASTRO-INTESTINAL.

These types and their respective sub-types are determined by the aptitude the poison has for settling upon the centres of least resistance, which vary with the individual constitution. In other words, Inf. seems to have the property of picking out the weak point in the armour. The form is also determined in a general way by the special character (e.g., nervous) of the epi-or pan-demic. It is possible, of course, that the types may be the product of symbiotic bacterial association, varying with time, season, and place, though that but slightly.

DIAGNOSIS: While in the ultimate analysis, all cases can be traced primarily to one or other of the foregoing subdivisions, many cases are found to simulate other diseases. The diagnosis is usually easy when the disease has assumed epi- or pan-demic proportions, the profoundness of the prostration - out of all proportion to the intensity of the disease -

being one of the very characteristic features. In many cases, however, the disease is somewhat a-typical, especially as regards its onset, and particular investigation (bacteriological examinations, blood-counts, etc.) is necessary.

DIFFERENTIAL DIAGNOSIS:

1. Simple Coryza or Bronchial Catarrh: Distinguished by sudden onset, rapid course, nervous symptoms, rash, and splenic enlargement, but an intense catarrh ("Influenza-cold" or pseudo-influenza) may be indistinguishable - except bacteriologically by examination of sputum - from a mild attack of true Inf.

2. Dengue: Catarrhal symptoms, severe pains in joints and muscles, also the more widely-spread epidemic incidence and higher mortality suggest Inf., but it is communicated by an intermediary mosquito, not directly from the sick to the healthy, and has an early erythematous and late rubeolar eruption with desquamation.

3. Enteric: Inf. may commence with gradual pyrexia, diarrhoea, rose-spots, splenic enlargement; or epistaxis and nervous sympts. - common to both - may be present. Generally speaking, the sudden onset with rigors and immediate high fever distinguishes from the staircase rise of enteric, and the subsequent character of the termperature chart. Leucocytosis is absent in both diseases when uncomplicated. In the "typhoid form" Inf. is marked off by coryza and conjunctivitis; enteric by positive serum reaction. After both conditions there may be mental aberration.

4. Paratyphoid: Here the similarity may be rather close.

Blood culture as a rule is only positive at the beginning of the disease, and even at this state negative results are common. It is important to note whether the patient has had anti-typhoid inoculation, as agglutination reaction in paratyphoid is less constant in such cases. The Para-typhoid bacillus can be cultivated from the patient's blood, stools, or, more rarely, urine. Leucopenia is the rule.

5. Typhus: The maculated rash of typhus (which is lice-borne) is diagnostic. The production of artificial stasis of the vessels is also useful. A bacillus (X 19) allied to Proteus Vulgaris has been isolated from blood and urine.

6. Malaria: The febrile variety, especially when the temperature is intermittent, is very apt in the tropics to be mistaken for malaria. Especially is this the case when the pyrexia is the only visible manifestation of the disease - a condition well-known to occur. A blood examination will supply proof positive.

7. Trench-Fever: The Pediculus Corporis is the vector in trench-fever - where the secondary fever suggests the appearances met with in Relapsing Fever. The "break-bone" shin pains, and a dry tongue with yellow fur down its centre flanked by red margins, further characterises it. Lateral nystagmus, with suffusion of the conjunctivae, appears to be common both to trench-fever and to Inf., though more rarely in the latter. Sequelae are almost entirely confined to the heart in trench-fever; seldom also are considerable numbers of a unit affected simultaneously. Pulmonary and renal complications indicate Inf.

8. Phlebotomous or Sand-fly Fever: There is no lacchrymation or respiratory catarrh, as commonly present in Inf. The fever only lasts three days, recovery being the invariable rule.

9. Acute Miliary Tuberculosis: Catarrh, conjunctivitis, and T.B. distinguish. Protracted cases which drag on for weeks, and frequently die from exhaustion, present a close resemblance to Acute Tuberculosis. Pleurisy (dry or with scanty effusion) may further blur the picture.

10. Phthisis: Cases of Inf. which never properly pick up and which show indefinite signs of patchy consolidation of the lungs, frequently present a cachectic appearance, and show pronounced evening rise of temperature. There may also be haemoptysis. When Inf. bronchitis affects one or both upper lobes only, an apical pulmonary phthisis may be suggestive.

11. Maningococcal Meningitis: Lumbar puncture and bacteriological examination of the C.S. fluid is advisable, but in Inf. cases there is sometimes no sign of increased intercranial pressure or excess of albumen, while the fluid may be almost clear and the cells pure.

12. Acute Encephalitis Lethargica: This acute general disease is associated with progressive languor, apathy, drowsiness passing into lethargy, muscular weakness merging into complete disablement and various paralyses of muscles, chiefly of eyes and face. In the Lethargic type of Inf. the onset is more sudden with high fever.

13. Scarlatina: Various forms of exanthem are described under special "Cuticular features". The clean, raw, papillated

tongue and dirty throat do not co-exist as in Scarlet Fever. In Inf. the uvula is always swollen, oedematous, and of a pale waxy appearance at the beginning of the attack and lasting for several days.

14. Measles: Conjunctivitis, tonsilitis, laryngitis, bronchitis, frontal headache, etc., common to both. On the fourth day, blotchy rash and secondary rise of temperature indicate measles. Koplik's spots and general erythema of gums and pharynx stand for measles, while enlargement of the anterior papillae of tongue and erythema of anterior pillars of the fauces reveal Inf. (Franke).

15. Pertussis: In addition to the paroxysmal cough, sometimes very similar, there may be peri-ocular puffiness with conjunctival injection going on to pus formation and occasionally associated with blepharitis.

16. Inflammatory Conditions: Inf. may certainly be complicated by appendicitis (vide "Digestive Manifestations"), Splenic and hepatic enlargements in Inf. are only rarely present.

THE FEVER: Incubation and Onset:

The characteristic sympts. of typical Inf. in its incubation and onset are as follows:-

The very short incubation period - probably not more than two to three days at most, and oftener one to two days - renders the multiplication of infection much more rapid than, for instance, measles, in which nearly a fortnight must elapse between incubation and illness. The temperature rises rapidly

to 102°-103°F., while hot and cold fits alternate. This almost invariably sudden pyrexia, which is of one or two days' duration, begins with a slight feeling of chilliness, shivering, a sensation as of cold water running down the back perhaps amounting to a definite rigor, accompanied by severe headache (frontal, occipital, or diffuse), pains in the back and limbs and marked anorexia and malaise, amounting to prostration quite out of proportion to the other sympts. Only cholera causes such sudden collapse (Goodhart). The onset may indeed be strikingly sudden. A patient may retire to bed apparently well and wake up with general aching, headache, malaise etc., or he may be at his work when he suddenly feels violently dizzy and immediately falls to the ground in a state of collapse. The condition is dominated by chilliness and malaise, which two sympts. become quickly worse for each minute the patient is up and about.

SIMPLE FEBRILE VARIETY.

In very mild cases these sympts. disappear after profuse sweating in so short a time as 48 hours, leaving more or less post-febrile lassitude and prostration which may last for some time. In other cases the onset is followed by the usual physical signs of fever - anorexia, heavily-furred tongue, constipation, a somewhat toxic appearance - with the addition of a short, frequent harassing cough without expectoration. The pains, especially in the head, become very severe, the patient feels thoroughly ill and is often restless, querulous,

and unable to concentrate his thoughts. Copious perspiration, sometimes continuous, is common. The initial rise of temperature may reach its acme in 24 hours. The duration of such attacks is not as a rule long, the temperature in straightforward cases going down and the sympts. abating in two to four days, although the fever is very variable in all cases. Thus it may last five, and even nine or ten days. While the fever as a rule presents no definite type,unless some complication predominates, there are various grades of severity from the mild type common at the beginning of an epidemic to the serious type at its acme. Thus, in the last epidemic:-

(a) A very mild infection at first obtained, the incubation, fever, and convalescence each lasting three days, the ephemeral fever being succeeded by a decided subnormal temperature with pulse and respiration slow and bodily powers somewhat reduced.

(b) Later, the catarrhal and other signs and the pyrexia subsided more gradually, leaving the patient considerably weak and depressed, languid, and unable to eat for perhaps 10-14 days after the fever was over. In convalescence there was also a tendency to tacchycardia on slight exertion. Renal irritation was usually present.

(c) The character then became much more severe, the duration longer, and the complications more severe e.g., the patient sometimes passed into a typhoid state with intense prostration, bronchitis and broncho-pneumonia supervening.

(d) Finally, as the pandemic waned, there was a tendency towards longer duration but less severity.

The temperature falls fairly rapidly, but not with any typical crisis; on the contrary, in nearly all cases, defervescence is by lysis. Sometimes the temperature is inclined to be intermittent - it may oscillate between 102°-104°F. for

three to four days before yielding. It is to be noticed that in this simple febrile variety there is no appreciable coryza or bronchitis, and there are few if any respiratory sympts. which however are liable at any time to develop. In uncomplicated cases there is the usual sudden onset of fever, with rather well-marked general sympts. lasting several days, but if the patient is kept strictly to bed recovery under simple treatment is the rule. Convalescence is nearly always prolonged after the febrile form, a considerable time usually elapsing before the patient feels quite right again. The febrile was the most common variety of Inf. in England in 1889-90 (q.v.) and was then frequently followed by severe mental depression as well as physical debility. The simple febrile variety is especially frequent in children. It has been called the "child-type" of Inf. In children, too, there is often a great desire to sleep the whole day - in some cases the somnolence being the only symptom from first to last, especially in the five-day type. The virus of Inf. is a cardiac-depressant, as is that of diphtheria, and consequently the Pulse seldom undergoes any acceleration proportionate to the fever e.g., a pulse of 85 is not infrequent with a temperature approaching 102°F. In this respect it perhaps resembles enteric. One has seen a slow pulse (76-110) even with a temperature continuously high.

The state of the Tongue merits attention. At first generally large, soft, tooth-indented, and moist, it is uniformly coated with a white fur, giving it a porcelain appearance. Whether slightly or heavily coated, it may be bright red

at tip and edges. Sometimes it remains filthy for some time after the febrile stage. In such cases food is generally not only utterly tasteless but repellant. Even in this variety, the mucous membrane of the mouth and also of the palate, tonsils, and pharynx may be reddened.

The following case illustrates the type of Simple Febrile Influenza:-

CASE. E.F. (Policeman, aet 27).

The onset sudden and acute. He had been "perfectly fit" and when on duty in the street was taken ill with a sense of general malaise and "could hardly drag his limbs along", but rallied sufficiently to be able to get himself with some difficulty back to his quarters. He was supported to bed and only too glad to stay there. Seen within a few hours - he complained of chilly feelings, aches in the back, limbs, and head, and of a rapidly developing sense of prostration. Temp: 103°F. Pulse: 90. Respiration-rate: between 18 and 30. The pulse was full and firm, its rate not raised proportionately to the temperature. The backache was lumbar, the general aching most severe in the lower limbs, and the headache frontal and associated with pain between the eyes. There was no complaint of sore throat, and on examination of the chest, physical signs were negative. The tongue was coated with a thick fur, superficially yellowish-brown at the back and on the dorsum, pale yellowish-white under the darker surface, but with no fur on the margins and tip, which were red and irritable. The skin was hot and dry.

He was very drowsy, although he did not manage to secure more than a little broken sleep. In addition to lassitude, he consistently refused food, appearing to be nauseated at the sight of it. He looked ill, but beyond the signs above named, presented no other symptoms. The illness ran a short course, the fever being characteristically of brief duration and of moderate intensity. The total duration of his confinement to bed was five days. Within 48 hours the temperature dropped by crisis to normal and rapid improvement at once set in. At this stage the skin became moist, he perspired freely, the tongue cleaned, and the patient began to feel altogether better. On the third day he sat up, looking and feeling well and began to display appetite. Anything set before him he took with avidity. Post-influenzal debility was not a marked feature here. He was soon able to go about his ordinary work.

The period of protection afforded by an attack of Inf. must be very short indeed, and this brief immunity is succeeded by a phase in which the individual is more likely again to develop the disease, if exposed to it. The duration of this period of pre-disposition has never been worked out, but it is unlikely that it exceeds six weeks. Individuals vary in their susceptibility:

Note: I, myself, had three attacks of Inf. within six months, It is possible that the recrudescence of Inf. in an individual like myself, dealing with large numbers of a shifting population, civilian and military, may be accounted for by the fresh infections

being of a variable character and virulence. In my own instance the second and third attacks were definite recurrences, or re-infections, not relapses, the intervals being considerable.

Relapses are, however, common, especially on the fourth day of a pyrexia and such - occurring often when patients are still in bed - are not apparently due to chill or exhaustion. They are always more serious than the primal attack, all the sympts. being exaggerated and convalescence prolonged. Relapses and complications are ushered in by rise of temperature. From the Public Health standpoint, the milder varieties of the disease, in which the patient is "at large" are more infectious than those cases where prostration is greater, and indeed Inf. - like scarlatina - is infective in the earliest stages before its nature is ascertained.

VARIATIONS: The more usual divergencies from normal that are generally met with in all epidemics may here be mentioned so far as they apply to the Simple Febrile Variety.

(a) Onset: Although the disease begins acutely it is not always so. It may begin sub-acutely but insidiously. Also it may start in the throat and within two to three days flare up into a bronchitis, without ever actually involving the nose. Types may, and very often do, blend in such a fashion that it is by no means always possible to say definitely that the condition belongs to this or that type e.g., in rare cases it may commence with an apoplectiform seizure, or an abrupt and profound prostration, without other indications of a nervous element. In cases not of a gastro-intestinal type, the disease may set in by vertigo, nausea, or actual violent vomiting of

bilious material, or by diarrhoea. Colicky, abdominal pains, without other symptoms and signs, except the fever, one has frequently observed, and such could not always be held to be of a referred character.

But of all variations in the onset there is most to interest and concern in those cases in which a grave form may follow hard on the heels of the initial symptoms. While the latest pandemic was at its height, patients were frequently seen in whom the grave sympts. of pneumonia were well established within 48 hours or less of initial influenzal sympts. of the Simple Febrile type. The course of cases, in which the initial stages were marked by high fever, and in which the onset was severe and attended by vomiting, seems to be almost invariably of graver prognosis, often pointing to pneumonic involvement. The temperature has been recorded so high as 106.6°F.; and conversely, with sympts. of a Simple Febrile variety the patient may feel cold and miserable, whether in bed or crouching over a hot open fire, and complain of chilliness in spite of all external warmth. On the other hand, the pyrexia may be almost the sole manifestation of the disease and may be very protracted, lasting in some instances for several weeks. (Vide Case Appendix). The cause of continuance of irregular pyrexia may sometimes be the presence of the bacillus Inf. in the circulating blood. In cases of hyperpyrexia or even long-continued fever with a dry tongue and sordes on the teeth, the subsequent prostration appears to be greater.

(b) Sequelae: General ill-health, anaemia, lack of

energy and muscular weakness, and loss of appetite are common sequelae. Other after-effects, of which the patient has often to run the gauntlet, are neuralgia, dyspepsia, insomnia, weakness or loss of the special senses (particularly taste and smell), abdominal pains - accompanied perhaps by a mild diarrhoea - sore throat, and rheumatism.

CATARRHAL-RESPIRATORY VARIETY.

In this type the onset is associated with inflammation of the mucous membranes of some portion or portions of the respiratory tract. The inflammation may be confined to the naso-pharynx, or may extend to the larynx, trachea, and bronchi, or even the lung tissue itself may be involved.

The simple form sets in with coryza and presents the features of acute catarrhal fever, but with rather more prostration. The symptoms, indeed, may simulate Hay-Asthma and when wheezing and dyspnoea are superadded to facial lividity and respiratory distress, the picture is that of ordinary spasmodic asthma.

The skin of the nose and cheeks is constantly red, indeed there may be a general flushing of the facies. The eyes tend to be bright and slightly injected, but the expression rather dull and heavy or even toxic-looking. The ordinary sympts. are fever; sneezing; tingling in the nose and a thin acrid discharge from the nostrils; a burning pain in the eyes and forehead; conjunctivitis and, in some cases, lacchrymation and photophobia; difficulty in swallowing; redness and

swelling of the pharyngeal mucosa with increased secretion of mucus and slight cough. The cough has features of its own. It may be either explosive, paroxysmal, or brassy. When pronounced it is dry, hard, frequent, hacking, and does not ease itself by its occurrence. Often it comes on in paroxysms suggestive of Pertussis. This circumstance led observers in the seventeenth and eighteenth centuries to confuse the two complaints. It is important to distinguish three varieties of cough:-

(1) The Laryngeal Cough - dry, hoarse, hawking, rasping in character;

(2) The Bronchial Cough - moist, wheezy, accompanied by a rattling in the chest;

(3) The Pulmonary and Pleuritic Cough - usually short and sharp, with the hand held to the side to ease the pain.

The cough does not cease when the fever abates, but often continues for three to four weeks, when it gradually disappears. Dyspnoea is observed in the large majority of cases even when there are no symptoms of bronchitis. Apparently dyspnoea is, however, usually due to the acceleration of the respiration-rate. This frequency may be out of all proportion to pulse or temperature - "50 per minute being often maintained for a week with pulse not above 110". (Cole).

The Expectoration, scanty at first, may be blood-stained, as might be expected from the straining paroxysmal cough that later obtains. It is usual to become first profuse and glutinous and then purulent. In Influenzal Bronchitis the sputum varies in amount from moderate to copious. The

appearances are so variable that a classification is necessary. Five main varieties of Influenzal sputum are given below, but there are intermediates which cannot be given place:-

(a) Thin and Glairy or Mucoid and Frothy Sputum: perhaps tinged with bright blood, later becoming purulent and copious.

(b) Muco-purulent, or purulent Sputum: yellowish-green and nummular. Either a relative paucity or entire absence, or a very abundant expectoration, indeed amounting to a bronchorrhoea. It may also be of a bronchiectatic character. A propos it may be noted that in Influenzal broncho-pneumonia there is an increased tendency to paralytic filling of the lungs. In this variety streptococci are got often mixed with Bacillus Influenzae.

(c) Salmon-pink Sputum: acute broncho-pneumonia is frequently associated with blood-stained sputum of salmon-pink colour.

(d) Haemorrhagic Sputum: this may be abundant. The blood may be bright red or of a dark clotted nature. Mixed in some cases with purulent or serous expectoration, it may become a dirty sanguineo-purulent. It is often streptococcic.

(e) Definitely Rusty Sputum: comparatively rare. Thick and viscid, it is not of such a glairy tenacious consistence as the true pneumonic sputum; it is mostly pneumococcal.

The pulse is usually full and tense in this variety. The fever, during which the bowels as a rule are confined, generally lasts for some days - 3-4 in simple, 7-9 in severe. In comparison with that of the Simple Febrile type, it is generally slower, with remissions, and does not reach its maximum for two to three days. It is accompanied by sympts. of laryngitis (hoarseness, pain in larynx on swallowing, sympts. of asphyxiation). The vocal cords may be "swollen and congested and are sometimes intensely red" (Mackenzie). The sympts. vary from a husky-voicedness to being unable to phonate at all. In fact,

laryngitis may be the chief feature of the attack.

By further extension of the process, bronchitis often ensues and may likewise vary in degree from a mere soreness of the chest to deep-seated and general bronchitis. Among young adults this may take a peculiar and fatal form, described as "purulent bronchitis" or as "acute suffocative catarrh". (Laennec).

When affecting the lungs, certain physical signs absolutely characteristic of the disease are manifested, viz: explosive inspiratory crepitus, scattered through the lungs - especially posterior lobes - often wandering from one part of the lung to another, unattended with percussion dulness. Influenza-pneumonia usually begins 6,7, or 10 days after the first sympts. have appeared viz: in the post-febrile or stage of depression, and accordingly, even in straight-forward cases the prognosis is worse than in pneumonia à priori. It may be massive (lobar), or multiple and patchy (broncho-pneumonia), and in the latter, and commoner type, it may be invading one part of the lung while resolving in another. This "creeping" tendency is very typical.

The catarrhal - respiratory type is the only type which seems to invoke the risk of infection to others and also the type most dangerous to life in its special liability to inflammation of the lungs, which affection is not to be regarded as a sequel or integral part of the illness, but as a true complication.

The following case illustrates the Simple Catarrhal-

Respiratory type of the Sthenic Variety.

CASE: A.R. (Bank Manager aet. 34.)

During the epidemic the patient was suddenly taken with the usual feelings of chilly feeling, frontal headache, severe general aching and weakness, with dizziness, and took to bed. On being seen, he complained of an uncomfortable feeling of tightness in the nose, soreness in the throat, and smarting in the eyes, also of fits of sneezing which greatly aggravated his headache. There was an acute inflammation of all the mucous membranes of the mouth (including gums and tongue) and of the naso-pharynx. A milky mycelial growth lined nearly all the inside of the buccal cavity, especially in the vestibule of the mouth opposite the last molars. The gums were tender and inclined to ooze spontaneously, bleeding slightly on touch. The breath was heavy and foul, the tongue well coated. The temperature was 100.8°F. and the pulse quick. On the second day he was a good deal worse; the temperature rose to 101.8°F. and a tight, dry cough appeared. There was much running at the nose and painful photophobia. Anorexia was marked. The third day saw an improvement in the general feelings of discomfort, though the physical signs were, perhaps, better marked. The cough was raucous and more troublesome but still slight, without expectoration. A few sibilant râles were heard during the coughing fits. On the afternoon of the fourth day the temperature reached normal. By the fifth day he declared himself much better, appetite began to return, headache and

photophobia were much less. On sitting up in bed, however, he felt a little faint and sick. Temperature subnormal. On the sixth day the patient quite well, and was allowed up for a little, but felt slightly giddy; there was some tacchycardia of the supra-cardiac "nervous" type (the D.A.H. syndrome). This, however, probably sprang from pure "anxiety" and was transient. Seven to ten days elapsed before he had completely recovered strength after getting up.

RESPIRATORY TRACT:

The air passages, in which there may be marked congestion from nares to pleurae, may now be considered in greater detail. It was noted thirty years ago that, while the respiratory mucous membrane is without doubt the seat of the primary lesion, any section of the membrane may be affected without implication of the remainder.

Nose and adjacent Sinuses: In the early stage, Acute Rhinitis, often accompanied by Epistaxis, may occur. The typical picture of an intense coryza need not be elaborated. A distinction has been drawn between the common coryza and the coryza of Inf. In the former, acrid nasal discharge is said to be more frequent, though in this there is much variation, as comparison of past epidemics will show. The true distinction from an ordinary "cold in the head" is by the presence of rigors, pains, fever, and other general symptoms.

Copious repeated epistaxis, sometimes necessitating plugging, occurs perhaps more frequently in severe cases, but is common among those of a milder type. In former epidemics -

1582, 1732, 1758, 1803, this is especially noticed.

Septic infection of one or more accessory sinuses may occur. This is mostly secondary to a sore throat, and by this time general sympts. are at a stage when the real condition may be recognised. A profuse, foetid, muco-purulent, or purulent discharge, associated with tenderness and swelling round the orbit (as in Pertussis) and pain along the branches of the Trigeminal nerve, may direct attention to an inflammatory process - catarrhal or purulent - in the adjacent frontal, ethmoidal, or maxillary sinuses. The sphenoidal sinus may be similarly affected (Thompson), post-nasal discharge, occipital pain, or pain between the eyes, and somnolence marking the condition; while, in the former cavities, obscurity to Transillumination is obtained. Anosmia, due to a neuritis of the Olfactory nerves, is a common sequel which may persist for months. Very distressing Inf. headache is often associated with Sinusitis, and stubborn supra- and infra-orbital neuralgias, not infrequently own the same source.

Pharynx: The typical catarrhal condition of the naso-pharynx and pharynx in Inf. is a diffuse inflammation. An erythema involving the soft palate, uvula, and pillars of the fauces may be present, but in the last pandemic the visible changes in the throat were little marked.

Note: Personally have not seen more than an odd case in which Follicular Tonsilitis or enlarged cervical glands were present.

Follicular Tonsilitis associated with infection from the teeth may appear, or a false membrane may extend into the fauces.

Paralysis of the soft palate and dysphagia or even hyperaesthesia or aesthesia (as in diphtheria) may follow as a legacy left by Inf. (Thompson). Vide Peripheral Neuritis, Nervous System.

Larynx: Naso-laryngeal catarrh is of constant occurrence in ordinary cases. The larynx may be the seat of severe inflammation. If the hyperaemia of the laryngeal mucous membrane be intense, haemorrhage from the larynx may occur. Abscess formation may result from the acute inflammation. A loud paroxysmal and inveterate cough, occurring night and day, is another aftermath of Inf. ("Sheep's cough" - from the bleating sound). When severe it resembles Pertussis. The point of irritation may be either in the larynx or pharynx. The origin has been demonstrated to be pus in the accessory sinuses trickling back into the naso-pharynx and various sympts. simulating phthisis may accompany the condition e.g., rise of temperature, purulent expectoration and haemorrhage, sweats, loss of weight, dysphagia. As a rule, however, the distressing cough - dry, or with a scanty glutinous expectoration - is the sole complaint.

Laryngeal Palsy with painful hoarseness may be a sequel. One or both vocal cords may be paralysed - abductor paralysis being the usual form. The voice may be but slightly altered and clear up rapidly, or aphonia may become established permanently. Where other parts of the larynx than the cords are affected, the sympts. are those of a raw, burning pain, a swollen feeling and dysphagia.

Note: A rare but extremely fatal complication is acute septic oedematous laryngitis leading to extensive ulceration and necrosis.

Trachea: On laryngeal examination, an intense scarlet injection of the mucous membrane may be seen. Tickling or burning pains, with a feeling of rawness along the sternum - pressure of which is painful and may produce an irritating cough - marks the implication of the trachea. Leichtenstern maintained that the spasmodic, convulsive cough of Inf. bronchitis depended on inflammation of the trachea at the point of bifurcation of the main bronchi. The "terrible tearing cough" associated with suffocation, described in the early epidemics of 1410 and 1510, points to congestion of the trachea. Tracheitis may also be ulcerative. It is certainly sometimes pseudo-membranous, causing dyspnoea, stridor, and inspiratory retraction of the lower ribs. Spasm of the diaphragm or glottis and inability to swallow - a condition resembling diphtheria in children, and necessitating tracheotomy - is of rare occurrence. Tracheitis has often been regarded as a forerunner of broncho-pneumonia, but it is not essentially so, and may be absent throughout.

Severe Forms of Catarrhal-Respiratory Tract: The graver manifestations of this type are Bronchitis, Pneumonia, and Pleurisy. While the deaths directly attributable to Inf. are few in proportion to the number of cases, and while in milder forms it offers hardly any danger to life if reasonable care be taken, in the severer forms it is a very fatal disease. Particularly in all bronchial and pulmonary complications is

there a high case-mortality. As in simple Inf., the liability to contract the disease, and the danger if contracted, are increased by sedentary, and indoor occupations, and by depressing conditions, such as exposure to cold, or to fatigue, physical or mental, so, speaking generally, is there a stronger tendency to serious respiratory complications when the maintenance of health is not preserved. Acute naso-pharyngeal catarrh may open the way for pneumococcal, streptococcal, and tuberculous infections, but most commonly it may end in chronic bronchitis. The causal organism of Inf. may be similarly associated with various strains of cocci and bacilli, which may enter hand in hand with it, or follow in its train. Pulmonary complications are less usual at the beginning of an epidemic than later on.

Bronchi: The phenomena on auscultation vary according to the extension of the bronchitis into the larger or medium sized bronchi or into the bronchioles. The usual sympts. of onset are shortly followed by increased rapidity of, and difficulty in, breathing; a sense of constriction in the chest and pain behind the sternum and a frequent, short and very distressing cough. The sputum (vide p.68) presents characteristic peculiarities. Usually it is greenish-yellow, viscid, adhesive, and contains nummular masses, and occasionally fibrinous casts. In some cases it is blood-stained, and may even be dark red from the presence of blood. The pulse is often small and weak. In severe cases there is marked lividity, together with a considerable degree of dyspnoea, and delirium is not uncommon.

Bronchitis may be said to be first "dry", later "moist", with the abundant muco-purulent expectoration above described. Constancy of diffuse, moist bronchitis has been observed in severe cases. In some cases only "purulent bronchitis" is displayed. Chronic bronchitis may take the form of a spasmodic asthma, or produce sympts. of spurious Angina, or may result in dilatation of the bronchial tubes (Bronchiectasis).

The distinction between severe bronchitis and broncho-pneumonia is not easy, either in theory or practice. In fact, co-existing as they do in most cases, there may be said to be no real clinical distinction. Severe, prolonged cases are, in brief, characterised by a high and very irregular temperature; a rapid pulse; dyspnoea and cyanosis.

Bronchioles: If the initial bronchitis extends to the final ramifications of the bronchi, capillary bronchitis or broncho-pneumonia is likely to ensue. If there is diffuse extension into the bronchioles the patient becomes more deeply cyanosed, the difficulty in breathing increases, and the heart fails. Acute Bronchiolitis is a very severe condition, and fatal results are not by any means confined to weakly individuals. In the "fulminant form" death occurs in from 24-48 hours, the onset being so sudden that the patient becomes cyanosed within a few hours. The pulse becomes uncountable, and there is asphyxia (suffocative dyspnoea) as in acute Oedema of the Lungs. Indeed the two conditions may be got together.

Note: Several cases of Pulmonary Oedema on the eighth day with but little consolidation personally seen post mortem.

Lungs: The spread of the inflammatory process into the Alveoli produces inflammation of the pulmonary tissues. The number of causative factors productive of inflammatory conditions in the lung is large, the extent of such variable. In most cases where Inf.-pneumonia develops primarily the disease commences with a rigor. Where, however, pneumonia follows Inf. - and this is by far the most frequent - its development tends to be insidious and a rigor is not nearly so common - a relapse co-called with apparent recrudescence of the Inf. sympts. (high fever, without chill, increasing fever, intense cough, and perhaps lancinating pain) ushering in the attack. Pneumonia, co-existent with Inf. produces mixed infections according to the organisms present. In this way genuine Croupous or Lobar Pneumonia (fibrinous or sero-fibrinous) becomes a-typical, asthenic, and malignant. The Catarrhal, Cellular, or Lobular Broncho-pneumonia - the typical variety in all epidemics - may similarly vary from the classical picture, and may depend on the bacillus Inf. or be due to mixed infection e.g., the stretpococcus may à priori dominate the picture, resulting in what was known by Finkler over thirty years ago as a "primary streptococcus pneumonia". Inflammation of the lungs, whichever form it may take and whatever its pathogenesis, is invariably one of the most serious manifestations of Inf., accounting for perhaps 50 per cent in any epidemic. It may occur at the commencement of the attack with no definite Inf. period at all, or during the post-febrile stage. Most commonly the case seems to be one of simple Inf. for 1-3 days, then flares up into a

general systemic condition with very serious pulmonary involvements, despite every care in the early stage. True, primary, grippal pneumonia generally sets in about the second to the fifth day, very rarely as late as the ninth day and is usually preceded by bronchitis. With the rise of temperature, cyanosis becomes intense. This cyanosis is, however, not cardiac, the pulse remaining good and there being little sign of dilatation or failure of the R.V. unless in "cardiac" cases with early failure of the right heart. The dyspnoea - or "polypnoea" as it has been better styled - seldom amounts to orthopnoea, mild and severe cases alike preferring to lie flat. The expectoration becomes muco-purulent and on auscultation râles of all kinds are heard, chiefly fine crepitant; presently sub-bronchial breathing is discerned at different spots, or at the bases of the lungs with weak bronchophony and relative dulness and broncho-pneumonia is established. In some cases, especially in adults, the capillary bronchitis is of more importance than the pneumonia; in others, the latter predominates. Where the areas of consolidation are extensive, there may be compensatory emphysema. By the confluence of patches of broncho-pneumonia a pseudo-lobar pneumonia often arises. The patient may be slowly choked by the exudation of a secretion that cannot be stopped or expelled, or may succumb to heart-failure, or to a veritable septicaemia. The prognosis is bad as judged by embarrassment of respiration, cyanosis, and delirium. Very important are the sympts. and signs of commencing pulmonary complication; they may be thus summarized:-

1. Persistence of cough.

2. Gradual rise of temperature, or sudden elevation after it has reached normal, associated with rise in the respiratory-rate to over 25 per minute.

3. Chest signs. Deficiency of entry of air over one part of lung; signs of generalised bronchitis, or presence of dry or moist râles, limited to certain portions of the lung or lungs.

In some cases where a fatal result occurs within a couple of days after the onset, a small central patch of solidification has been found at the necropsy. In other cases - so frequent as to be characteristic, almost, - the broncho-pneumonic process may gradually spread throughout the lung from lobule to lobule, and even affect the opposite side similarly, so that during the course of the disease the entire lung tissue is involved in the morbid process. But fortunately, in cases of this "creeping type" the portion of lung first affected goes on rapidly to resolution and by the time the other parts are affected, is able to functionate. Such facts tend to induce the insidious onset and treacherous, a-typical course so characteristic of Inf. pneumonia. In yet other cases the pneumonic areas of consolidation are small and shotty and, from the resemblance to miliary tubercles, this form has been called "miliary pneumonia". Very rarely do dulness, bronchial breathing, and crepitant râles develop in the upper apart from the lower lobes. Acute broncho-pneumonic cases may be either haemorrhagic or suppurative. If sufficiently confluent, i.e., distributed amongst large patches of alveoli and bronchi, which run one into the other, there is dulness, tubular breathing, and increased V.R.

The following is a case of broncho-pneumonia of the severe, Confluent Type (double):-

CASE: S.R. (Cab-driver, aet. 37, plethoric, but of robust appearance.)

Seen on the second day of illness, there was a general papular redness of the face, in particular of the nose, brow, and around the eyes. This was accompanied by a profuse perspiration. There were extensive signs of very acute congestion at both bases, with markedly impaired percussion note, distressing spasmodic cough, and abundant sputum, frothy and pink, but becoming purulent.

Pulse: 120; Respirations: 32; Temperature: 104.2°F.

The congestion became even more well-marked, with patches of bronchial breathing, bronchophony, pectoriloquy, and sharp crackling râles over the whole of both lower lobes. There was a suggestion of extension of the areas of consolidation with crepitations over various parts of the lungs. On the third day the sputum assumed the character regarded by Pfeiffer as characteristic of Inf. i.e., coin-like lumps of a greenish-yellow colour, with streaks of blood. There were indications of acute, even fulminating sympts., viz: large confluent areas of broncho-pneumonia in both lungs, the lower lobes being practically solid. The facies, at first flushed with the unnatural redness of fever, began quickly to assume a slight cyanosis, or rather, livid colour, and to become if anything less of a purely red colour. It could not, however, be classed as "violaceous", the lips and

ears not being definitely of that dreaded hue. Judging by the extent of the consolidation alone, this case came under the category of "very serious", and the patient was injected with 80 million streptococci, pneumococci, and Inf. bacilli. That morning the patient looked very exhausted and the pulse was feeble. Brandy, 4 ozs. in 24 hours, was employed as a stimulant and oxygen was administered continuously for a number of hours at a time through a mask and warmed, but with questionable advantage. Grave anxiety was felt when signs of toxaemia appeared in the form of periods of low, muttering delirium, followed by stupor, and there were also phases of intense persistent headache and insomnia. In the evening there was little general improvement, but the temperature had fallen by rather less than 2°. The following day there was seen to be a certain improvement in the aspect, in the pulse, and in the respiration-rate. The temperature, however, had risen to 102.8°F. and there was evidence of continued toxaemia. A second injection of the same size was given, and a temporary fall occurred to normal. A third injection was given next day, and after this the temperature remained sub-febrile. Convalescence was very slow, and accompanied by the most extreme weakness, the lobar infiltration being very gradually absorbed. Indeed an exudate was suspected, but this was negatived by the use of the aspirating needle. Coarse, metallic râles were heard for weeks over the whole lower lobes, and there was a semi-purulent expectoration mixed with blood. This continued till complete

resolution. A year later the patient presented himself looking and feeling quite fit.

Note: One attributed the remarkably rapid course and rapid dissemination throughout the lower lobes especially to the double nature of the Inf.-pneumonia.

Pleurae: The so-called primary or idiopathic pleurisy rarely occurs as an acute primary inflammation; it has been shown to be in most cases of tuberculous origin. Secondary pleurisy is mostly associated with pneumonia, and may lead to Empyema. It does not usually appear until after the temperature has begun to subside. The turbid pleural exudate is generally sero-purulent, but may be haemorrhagic, or fibrinous, or sero-fibrinous. Empyemata have been found on direct smear to be oftener strepto- than pneumo-coccic. In such effusions, if resection be carried out and the fluid evacuated before the infected exudate becomes turbid (i.e., visibly purulent), the toxaemic sympts., it is generally held, are less likely to gain the upper hand, since absorption of fluid loaded with streptococci of a particularly virulent strain, as decided by preliminary aspiration, cannot but greatly endanger life. But Empyema, which generally affects one pleural sac, is the commonest form of localised abscess and this by a deflection of the toxins to one definite pus focus may convert a septicaemia into a local "fixation abscess". The prognosis in grave cases has been found by many observers to be even sensibly improved. On the other hand, especially if bilateral, there may be cyanosis, severe dyspnoea and marked cardiac asthenia, which may prove fatal even to robust young adults. Also,

abscess formation may lead to gangrene, just as Inf. pneumonia in bad cases not altogether infrequently terminates in necrosis. Large pleural effusions are relatively rare, especially in virulent infections, but it is to be noticed that acute Pericarditis may occur in pleurisy, and there may be serous haemorrhages into the pericardial sac, or into the pleurae.

NERVOUS VARIETY.

Next to the respiratory system the most frequently affected is the nervous system. The Inf. toxins being "intense nerve poisons" the clinical pictures consequently exhibit the most kaleidoscopic variety.

If the patient is of a neurotic temperament, nervous and neuralgic sympts. are more likely to develop. As a rule no catarrhal sympts. are manifested. After the usual prodromal sympts., which may continue off and on for 2-3 days, in which the temperature may or may not be elevated, while the pulse is not necessarily quickened, but is small and weak, - marked nervous sympts. occur, these being in obvious disproportion to the height of the temperature and the rate of the pulse. A severe pain in the head and eyes is felt, often with exquisite tenderness at the back of the eyeballs and pain in moving them. Pains in the small of the back, nape of the neck, and in the limbs - for the most part in the fleshy portions of the calves and thighs - but also in the bones and joints (especially knees) and even in the fingers and toes - are experienced.

In mild cases intense headache, photophobia, neuralgia

(especially of fifth nerve) and insomnia may be the chief sympts. In some the infection is not ushered in in the characteristic fashion, but may resemble a fit (general and local spasms). There may be but one convulsion, or the case may lapse into the cerebral type. Apart from acute infection of the cerebrum, Inf. may give rise to the most varied nervous sequelae, e.g., the prolonged and even permanent loss of the power of smell and taste (vide special senses), neuralgia and pain in the ears, sharp pains in the kidneys and testes, chest pain, unassociated with bronchitis or especial catarrhal cause. Paraesthesiae of every kind have been described as sequelae, and vary from vague pains or numbness to the "needles and pins sensation", or even the excruciating pains which simulate the lightning pains of Tabes. Migraine may become aggravated, and be frequent, intense, and obdurate.

As a sub-type, a "Rheumatoid variety" is sometimes recognised from the severity of the pains in the bones and joints. Infective poly-arthritis, however, occurs as an occasional sequel to all infectious diseases, so it is doubtful if the term is justified. Speaking generally, there are no definite joint lesions, though arthralgia in knees and shoulders may be complained of. Influenzal Synovitis, which is of a mild and transient character, is of very infrequent occurrence, and as in rare cases of Ostitis and Periostitis, the cause may be the lighting up of sundry old inflammations (acute rheumatism, gonorrhoeal rheumatism, and rheumatoid arthritis) by the Influenzal attack. In the true nervous type the pains are not

strictly arthritic.

The initial aches and pains affecting the posterior muscles of neck, back, and limbs and common to all varieties are much more pronounced in the nervous variety, e.g., the pain in the bones has been described as like that of fracture. Frequently there is restlessness and insomnia, the general nervous prostration and muscular weakness being often extreme. There is usually much more depression in this type. The face is generally extremely pale. After defervescence the heart tends, as in all types, to become a little slow and irregular as a result of febrile and toxic processes. In this type anginoid pain is, however, only of occasional occurrence (cf. the purely "Cardiac type"). Perhaps the most outstanding feature of Inf. and certainly that which victims have learned most to dread, is the prolonged debility and nervous prostration that frequently follow an attack. Many patients, whose Influenzal picture was normal, suffer from pronounced nervous sequelae (as depression, neurasthenia, neuritis, etc.) for six to twelve months after. Especially was this the case in the years 1889-90, in which the specific infection attacked more particularly the nerve centres. In favourable cases the intense lassitude and depression clear up in a comparatively few days.

The following is a case of the Nervous Type:-

CASE: C. M. (Chauffeur aet. 37.)

The patient was able to give the precise place and minute when he began to feel unwell. He dropped and was carried home, and when seen within twelve hours showed a temperature

of just over 103°F. and looked excessively ill and prostrate. Respiration and pulse were not much accelerated. All sense of taste and appetite was lost. The tongue was white and creamy and there was nausea and slight vomiting. He complained of racking pains in the back and limbs (at first vaguely referred to the muscles chiefly above the knees); chilly sensations; and a general sense of aching all over, as though he had been beaten with sticks. Pain in the head was referred to the frontal sinuses, that in the eyes to the back of the globes. The headache was of such special severity that he obtained no sleep and was in a state of nervous restlessness and intense discomfort, moaning and tossing himself about, and now and then giving way to weeping. While not delirious, he appeared to be really obsessed by the pain and this highly-wrought condition continued off and on for two to three days. During this time he received considerable doses of salicin (grs. XX every 2-3 hours for 12 hours, then in smaller doses at longer intervals). This treatment with tepid sponging effectively reduced the temperature, and the pains in the bones and joints and small of the back, and he perspired copiously; but the mental unrest did not subside until a hypnotic (paraldehyde drs. i) was administered. There was inordinate depression as an aftermath. It is noteworthy that he demonstrated no catarrhal sympts. whatever.

According to Finkler, "there is hardly a nervous symptom in existence which has not been observed in Influenza". These sympts. which may occur in the height of the disease or follow

in the wake may be either organic, or functional, comprising disturbances of the brain, spinal cord, and peripheral nerves and sundry attendant or consequent psychoses of almost unlimited variety. The nervous complications and sequelae arising in connection with this type and other types comprise a formidable list. It is not our intention to enumerate these in comprehensive detail, but rather to indicate such as are most frequent and most worthy of remark. It is to be noted that any form of nervous disorder may follow or complicate the nervous or other types of Inf.

I. The Affections of Sensory Nerves may now be reviewed:-

Headache: (Cephalgia) mostly frontal or orbital with retro-ocular pains is rarely absent. It may affect the temporal and occipital regions, or be evenly distributed over the entire head. In this variety it may be intense, dull, stabbing, or like the blows of a hammer. Often it is of that terrible kind that forbids sleep and even suggests intra-cranial mischief. Its severity may cause the patient to moan or rave, or to fall into a kind of pain stupor.

Carmichael Smith writing of this symptom in his account of the epidemic of 1872, says: (Vide Annals of Inf. p. 149) "The head-ach which accompanied the Influenza may be distinguished into three kinds:-

"1. The uneasy weight, soreness, and distension of the forehead usual in common colds;

"2. The violent sick head-ach, arising from affection of the stomach;

"3. The head-ach during which the patients complained of a sensation as if their head was splitting, with a severe shooting pain at the vertex: this last head-ach was most usual in peri-pneumonic cases and seemed chiefly occasioned by the violence of the cough".

Pain in the back and lumbar regions, intercostal neuralgia, pain in knees and calves, sciatica, and diverse arthralgias have been discussed. Neuralgias of sciatic, intercostal, and dorsal nerves may persist into convalescence, and become chronic. Post-influenzal neuralgias tend to be obstinate, e.g.,

Odontalgia, otalgia, mastodynia, sternodynia, xiphodynia, chondrodynia, costodynia, sacrodynia, cystodynia, coccygodynia, achillodynia.

Muscular neuralgias (myalgias) may be violent, occurring in groups of muscles (e.g., back, thigh, calf), highly painful on pressure, and are characterised like the simple neuralgias by periodic exacerbations - especially at night. General hyperaesthesia of the skin and organs of sense may be a feature, pain being elicited by either pressure or touch. Localised anaesthesia and paraesthesia of cutaneous nerves is sometimes found, e.g., complete loss of sense of taste, mild paraesthesia involving one leg, transient Bell's Palsy, etc.

II. Paralysis due to Neuritis is sufficiently common to claim place here. In all cases belonging to this group, there are no gross pathologic changes. The paralyses arise almost exclusively anything up to a few weeks after the termination of the Inf. attack.

(a) Local Neuritis: May attack certain cranial nerves, in particular the third, fifth, sixth, seventh, and eighth (Vide Special Senses Eye, Ear, Nose), the weakness, anaesthesia or paralysis following according to the extent of the process. Trigeminal neuralgia (in particular the supra-orbital variety) frequently dates from an attack, and there is a tendency to chronicity.

(b) Brachial or Sciatic Neuritis: Said to occur mostly in persons of gouty or rheumatic diathesis, may follow Inf. Severe lancinating pains, radiating along the course of a nerve-trunk or involving a plexus, are felt; tenderness on the least pressure, inflammatory or even oedematous swelling, articular stiffness, wasting or trophic lesions of skin and muscles may appear in severe cases, persisting for varying periods but clearing up more slowly in older individuals. The morbid process is "a peri-neuritic inflammation of the sheath of single nerves, or nerve plexuses, productive of isolated or grouped paralyses" e.g., radial, ulnar, and medial nerves, or peroneal, tibial, and crural nerves - producing combined or single paralyses.

(c) Peripheral Multiple Neuritis: A later complication, not usually appearing for 3-4 weeks after, is a morbid process apparently involving the nerve fibres, not the sheath, and is similar in character to other degenerative processes following toxaemic infections, e.g., diphtheria, typhoid, beri-beri, septicaemia, etc., or to chronic poisoning with alcohol, arsenic, lead, mercury. It is here microbic, not extrinsic. The onset is insidious, accompanied by tingling and shooting pains in the limbs. Muscular cramps and general nerve tenderness are experienced to a considerable extent. Weakness, especially of the feet and ankles, with gradual paralysis more motor than sensory, and muscular wasting with R.D. may develop. There may be bilateral facial paralysis. Multiple neuritis may be complicated by ocular and other cranial nerve paralyses, by myelitis, and by cardiac and respiratory paralyses, but these are much less common than in diphtheria.

Note: Cases are on record where an extensive paralysis (of the diphtheritic type but with no involvement of the fauces) has affected all the limbs. The diaphragm has been involved with fatal results, and all these more obscure cases have had an immediate history beyond all peradventure Influenzal.

III. Comatose or Lethargic Variety: This type, which has sometimes been mistaken for Acute Encephalitis Lethargica, and sometimes for "Botulism" (a condition due to the consumption of infected food), is characterised by high fever, drowsiness, apathy, and finally coma - the last of grave importance. It commences with a sudden attack of giddiness

and dazedness, or with an apoplectic or epileptic seizure, followed by total unconsciousness of several hours' duration, and succeeding typhus-like stupor. The actual attack may in such cases be mild. The simple coma due to the Inf. toxin, was referred to as far back as 1712 as the "sleeping sickness". In "stupor cases" the C.S. fluid on puncture shows 80 per cent lymphocytes. Leucopenia is the rule, and the prognosis is not good. Except when complicated, no gross changes are got in the brain.

Note: Young infants with Inf. lie in a prolonged somnolent condition throughout the febrile attack, and if fed recover rapidly. Children also tend to lie helpless and flaccid as though narcotised. Under this type come cases of Catalepsy or trance in adults. The contrast to cases of sleeplessness - also produced by toxaemia - is striking.

DIGESTIVE OR GASTRO-INTESTINAL VARIETY (AND PAROTITIS)

This type, the least common of the four, may be gastric, intestinal, or a general involvement of the alimentary canal, and is characterised specially by catarrh of the mucous membranes. The attack frequently begins with abdominal pains - usually epigastric. Nausea, and complete anorexia, amounting to a loathing against all food, sets in. Vomiting, usually exceedingly forcible, in which large quantities of bright green fluid are ejected, is not uncommon, more especially in adults. It may be associated with profuse, sometimes mal-odorous sweating, and jaundice of skin and conjunctivae. Definite jaundice is sometimes seen in cases of Inf. pneumonia, but cannot be said

to be of diagnostic significance. If intense, it is to be regarded as a bad omen, fairly-marked hepatic degeneration and occasionally perihepatitis being found P.M. There is often tenderness of the spleen, which is in this variety almost always enlarged (i.e., by percussion), and this persists after the acute sympts. have passed. Less often is the spleen plainly palpable, though in 1889-90 the lower pole was very constantly felt on palpation. The splenic hypertrophy is in proportion to the intensity of the fever. P.M. it has often been reported.

The temperature is raised at the onset of the disease, but not to the height of other types. The pulse is small and weak. There is the usual febrile mouth, with excess of slimy and most foul mucus, the breath being heavy and even markedly fetorous like the perspiration. The tongue is thickly-coated (except for a clear, marginal zone) with a white, creamy or blanket-like fur, which, however, is soon displaced by a thin yellow or brown coating.

A dusky flushing of the face and chest is evident.

Constipation is the rule, but independent of purgation there may be <u>choleraic</u> and <u>dysenteric</u> forms. Here the hyperaemia of the interstinal mucous membrane may progress to inflammation, necrosis, and ulceration. In the first - profuse serous diarrhoea, cyanosis, and shrinking of the tissues are seen. In the second - the stools contain mucus and blood. In more serious cases meteorism, tenesmus, severe colic, and peritoneal sympts. may occur with haemorrhagic enteritis, and collapse may supervene. An intense feeling of mal-de-mer with

nausea and vomiting may be incessant. Any old tendency to catarrh of the digestive mucous membrane is at once intensified in the presence or the wake of this searching malady. Distinction must be drawn between neuralgic pains affecting the thoracic and abdominal viscera, and the actual disorders of these organs, as for example: renal or vesical calculus, hepatic or intestinal colic.

Note: Inf. may undoubtedly be complicated by appendicitis - one perforated and several acute catarrhal appendices with much congestion of the terminal inch personally seen on the operating table.

The following is a Case of the Digestive Type:-

CASE: R. T. (Domestic Help aet. 30, dark-haired, dark-skinned, and of a bilious temperament).

Complaint of violent pains in the abdomen, these having come on suddenly with headache and prostration. They could not be attributed to any recent indiscretion of diet, or digestive derangement. Within a few hours, when seen, she was found to have a temperature of 101.5°F., and was in considerable pain. She complained of a bad taste in the mouth, the exhalations were observed to be very offensive, and there was a sickly slate-coloured tongue. Nausea and severe retching and vomiting of a bilious nature occurred. On examination of the abdomen, there was seen to be tenderness to pressure and pain in the epigastrium and other parts of the abdomen. The recti were inclined to be rigid. There was some borborygmus and the abdomen was distended. Cardialgia was present. Diarrhoea set in that same day and was copious and slimy with some tenesmus and a slight streaky

haemorrhagic discolouration. The patient began to speak also of vague pains in the limbs and "the small of the back". Beyond such, there were no definite nervous sympts., and chest sympts. were absent. That evening the temperature rose nearly to 103°F. and there were signs of collapse; but the following morning the fever abated. For 2-3 days there was some dubiety as to whether the abdominal pains were of a referred character, or whether the condition was that of gastro-enteritis or perhaps appendicitis. After the third day, slight splenic enlargement on percussion was found. The whole condition cleared up rapidly after drenching sweats of a peculiar sickly odour. The tongue did not lose its dirty-white colour till the eighth day.

Note: The vomiting was found to be distinctly controlled by bromides. From the fact that there was marked pain about the region of the appendix, the lowest portion of the ileum was likely affected, there being no subsequent reason to believe that there had been the coincident occurrence of Inf. with an ordinary appendicitis.

The "typhoid variety" is a combination of nervous and gastro-intestinal varieties. Thus, one may get cephalgia, delirium, apathy, and an elevated protracted fever with severe diarrhoea, meteorism, (usually a late unfavourable sign) and perhaps a dry tongue. (For the distinction from enteric, vide differential diagnosis). The Inf. element is usually seen in the intense headache, backache, and joint pains at the outset, and in copious perspiration. Herpes nasalis vel labialis may appear. The gastro-intestinal variety may also be complicated by respiratory phenomena. In such cases, however, the

former phenomena tend to take a back place.

PAROTITIS: Swelling of the parotid gland and capsule, which is an occasional complication of all infectious disease, may occur, especially if the hygiene of the mouth is not preserved.

This condition which happens in mild as well as severe cases of Inf. may be uni- or bi-lateral, and may be due to mumps developing during Inf., or infective paratitis other than mumps arising as a complication of Inf. In the absence of an epidemic of mumps, and also in view of the facts that free movement of the jaws is often possible and that "the duct mouths show little change", the condition is more likely to be the latter. (One case personally seen where the patient had already had mumps).

Simple Orchitis (swelling of the Testicle and its coverings) and Ovaritis may occur in conjunction with it. The parotid glands may suppurate and suppurative orchitis and gangrene of the testicle, scrotum, or penis, may ensue, but all these are rare. Parotitis has been noted together with facial erysipelas complicating Inf. (Leichtenstern). This is probably due to a secondary infection with streptococci. Such cases as have been seen in the last Pandemic have been without much pain.

III. V A R I A T I O N S.

Many of the chameleon variations of Inf. have already received consideration, since these are often so closely akin to the primary forms of disease as to merit inclusion under the bold outstanding types. It remains to deal with variations of a marked character, and also certain variations as applied to complications and sequelae, which are not generally met with in all epidemics.

Affections of the special senses of Sight, and Hearing; abnormalities in respect of the Kidney, and the Skin, and conditions in which the Heart and Circulation are particularly involved, will be here discussed. The more unusual, but very important, Nervous variations remain to be taken up, and lastly, the Septicaemic or Toxaemic type, side by side with pneumonic and Other Pulmonary Conditions with which it is so intimately connected.

OCULAR PHENOMENA: Pain in the back of the eyes and tenderness of the globe have already been alluded to. This very usual pain in the eyeball, extending deep into the orbital cavity is a neuralgia of the intra-orbital branches of the trigeminus.

Frequently the eyes are suffused and there is slight

photophobia. In one case the intolerance to other than twilight illumination was equal to that in cases affected by mustard gas. Simple conjunctivitis, which is of regular frequency, may be accompanied by oedema of the lids, and "watery eyes" - all of which are of diagnostic importance. Abscess of the lids is uncommon. There may, however, be subconjunctival and episcleral ecchymoses and certain inflammations in the regions of the external and internal canthi. Retinal hyperaesthesia is a manifestation of the involvement of sensory ocular nerves. Corneal affections are rare, but are apt, it is said, to be protracted, resulting in permanent corneal opacity. In one family every member suffered from ophthalmia.

A remarkable condition (chronicled in the last pandemic by French) is the early drooping of the upper eyelid. This may occur in purely Inf. cases and in slighter "pneumonic" cases. In severe pneumonic and particularly in toxaemic cases, it becomes marked. The eye looks dazed, the conjunctiva is dull. Ptosis is to be regarded as a bad sign, due entirely to the highly toxic state of the blood and tissues. A similar nystagmus to that described in Trench-fever has been seen.

Haemorrhage - frequently referred to in Part I as of such common occurrence throughout the mucous membranes - may have serious consequences when occurring in the eye, e.g., a very great defect in sight will result from the occlusion of even a small branch of the retinal artery, while sudden blindness has been produced by embolism or thrombosis of the central retinal artery. So also retro-bulbar haematomata with

exophthalmos. Haemorrhagic inflammation of the macular bundle of fibres in the centre of the optic nerve producing retro-bulbar neuritis (Harris), could only result in permanent damage to the sight. Sudden blindness - clearing up later, but leaving permanent right hemianopia - has also been observed. This was probably due to a thrombosis in the occipital region. Optic neuritis with choked discs and retinitis - undoubtedly toxaemic - were commonly seen in 1889-90. Albuminuric retinitis probably occurs in a considerable number of severe nephritic cases initiated by Inf. Frequently there is loss of accommodation due to a localised paralysis of the ciliary muscle. Many other paralyses bear striking similarity to those of diphtheria - but in the latter they are less severe and clear up sooner. There may be an approach to the A.R. pupil, reaction to light being partially lost when reaction to accommodation is gone. Isolated muscular palsies of the external or internal recti; paralysis of any of the external ocular muscles; or neuritis of branches of the third or sixth nerves may be added. Such palsies usually clear up eventually, and the reaction of the pupils to convergence and accommodation gradually returns. The most common paralyses appear to be those of single muscles.

EAR CONDITIONS.

Otitis was recorded as a sequel so far back as 1580.

Statistics of large general hospitals show a great increase in ear diseases, both during the period of Inf. and

immediately succeeding it. The prognosis of inflammatory ear conditions is, however, very much better than when following C.S. Meningitis, Scarlatina, and Enteric.

Acute naso-pharyngeal catarrh, by diminishing efficiency, may occasionally initiate ear abscesses with perforation of the membrana tympani. Purulent infections of the bony cavities of the skull and face and meningitis may in this way ensue, by the introduction of the meningococcus. The catarrhal respiratory variety of Inf., though not comparable to a "common cold" in other ways, may cause approximate complications. Just as there is temporary loss of the special senses of smell and taste, so hearing is commonly dulled and sometimes lost, both in uninvolved Inf. cases and in those with pneumonic complications. Many such cases lose their deafness spontaneously after a few days or a week. Others have intense ear-ache (otalgia) from an initial abscess, followed by otorrhoea, especially in the catarrhal type. The causation of this deafness probably lies in the extension of the microbic infection from the mucous membrane to the Eustachian tube. The discharge from the ear may be pure blood i.e., there may be otitis externa with slight haemorrhage into the tympanic membrane with or without pain. Such a condition points to a very acute infection. In the last pandemic, otitis media was not infrequent. Acute suppuration of the middle ear promotes a strong tendency to mastoid abscess with all its dangers, but purulent Mastoiditis is relatively infrequent in comparison with Inf. Otitis. A peripheral nerve deafness has been known to follow Inf. from affection of the

eighth cranial nerve. Aural neuralgia, hyperaesthesia, and tinnitus aurium are noteworthy.

URINARY APPARATUS.

The urine is generally decidedly scantier in amount than normal, but suppression is not a feature. Its reaction is intensely acid; its specific gravity 1,015-21. It has been claimed as a special diagnostic feature that in Inf. the urine is "neither high-coloured nor lateritious", but one has generally found it dark red in colour and often showing an excess of urates and phosphates. In all these particulars it corresponds to Fevers in general. Furthermore, in almost all febrile cases a mild nephritis develops. On centrifugalisation, red and white blood corpuscles and fragmentary granular and hyaline casts, more rarely blood casts, may be observed. In quite normal cases albumen in small amounts is present, especially from the second to fifth day, but continuing often to the eighth or ninth day.

> Note: Whittingham finds albumen in 90 per cent of cases, varying from a faint trace to an easily recognised percentage (.5 per litre, Esbach). Hyaline and granular casts he finds in 50 per cent of all cases on third and fourth days - gone by fifth or sixth day, - the former more numerous in the severer five-day-fever type than in the three-day type.

While the kidneys are less seriously affected by the Inf. bacteria and toxins than by e.g., the toxins of scarlatina, diphtheria, and erysipelas, in cases where pneumonia appears as a complication, and especially if there be cyanosis,

heart-weakness, and large pleural effusions, renal mischief may be pronounced. Febrile Albuminuria has been extremely common in the last pandemic. Apparently of toxaemic origin, it nearly always diminishes gradually, so that even after mild Inf. too early a return to duty invokes a risk of the development of a true Nephritis. In "pneumonic" cases, where albumen to some degree is very often found in association with renal epithelial cells and even epithelial tube casts, oliguria is not usual. Haematuria as a complication to Inf. pneumonia is certainly in the main slight and transient, indicating an inflammatory congestion of an entirely temporary character. Occasionally typical renal Oedema (swelling of subcutaneous tissues of eyelids, lumbar region, and ankles) is seen. The kidneys are never palpable, but slight tenderness in both loins and pain across the lumbar region is commonly elicited. Inf. proved to be a serious factor in the broncho-pneumonia complicating Trench Nephritis each winter at the Front. When the patient was suffering from any old-standing renal lesion, a rapid increase of the renal inadequacy and a profound toxaemia led almost invariably to a fatal issue. Acute Nephritis has been frequently found with a grave form of "Purulent Bronchitis", proceeding in some cases to broncho-pneumonia. The picture is coloured by the characteristic sympts. of dyspnoea, heliotrope cyanosis, purulent nummular expectoration and pyrexia. There can be little doubt but that, even in the instance of healthy young adults, with no previous renal lesion, the complication lent a heavy bias to the already grave prognosis. Records of

such cases point to a high mortality - over 60 per cent. Fatal cases show a gradual fall of temperature with rise of the pulse-rate, a profoundly toxic condition associated with dry, black tongue, pronounced mental sympts. and sometimes a grey lividity of the facies.

If albumen is present in large amount in any given case, the condition may be held to be grave. Insomnia, tremor, dry mouth and tongue, sordes on lips and teeth, and excessive agitation amounting to or leading to delirium, often attend its presence. Even though marked diminution of the quantity of urine is not common, the percentage of albumen is then high. Another dangerous legacy of Inf. is the presence of sugar in the urine. While Diabetes Mellitus may be a condition latent before - a transient glycosuria flaring up under the influence of perhaps repeated attacks of Inf. - it is undoubted that post-influenzal neuritis is sometimes consequent on a diabetic condition. Acidosis, or the presence of acetone, has also been repeatedly demonstrated. Acetone is, however, usually transient. Neuritic Polyuria - a condition seen early in the course of Inf. - is attributed to an interruption, or rather disturbance, of the nerve supply of the kidneys.

Cystitis is occasionally left behind after Inf., as after other acute infectious diseases. Various neuroses (vesical spasm, paralysis, cystodynia, and enuresis) are other sequelae.

CUTICULAR APPARATUS.

The skin, in an attack of Inf., is generally moist and

the perspiration,which is commonly profuse,has been aptly described as peppery, mousy, fusty, or mouldy in smell. It may indeed be rankly mal-odorous, though it is questionable if this is pathognomonic, as has been stated, since in this respect there is probably as much variation as in normal health, only that in "Grippe" it becomes more pronounced. Sweating, which is to be regarded as a symptom of the acute stage, may be continued into convalescence. It is a sign of debility, and according to West, is commoner in the female. The drenching clammy sweats so often noticed may produce wide-spread sweat vesicles over the skin (sudamina and milaria). The skin tends to be unduly red, in particular the face, the general vasomotor erubescence approaching erythema. This in combination with the increased sweat secretion and a spasmodic cough may be held to be of diagnostic importance. The change of colour to cyanosis, either turgid, livid, or ashy, is of great importance in arriving at a true prognosis.

Herpes facialis is not rare. In addition to herpes on the usual sites (lips, alae nasi, and chin) there may be herpes of both ears and even of the tongue. Herpes is more common in proportion to the increase of pulmonary cases.

Herpes Zoster of chest etc., (<u>vide</u> Nervous System) is frequently met with, especially as a sequel of Inf. following on intercostal neuralgia.

Inf. has no proper rash. Various cutaneous eruptions were known to the old Inf. writers, - e.g., Purpura Haemorrhagica - either patchy or blebs - Erythema Nodosum and purulent

forms of Dermatitis are described in 1729.

The rash noted by Thompson in a certain small proportion of cases in 1889-90 was generally described as rose-coloured, disappearing on pressure and lasting 1-4 days, and usually followed by desquamation. It appeared generally on the second or third day, affecting the face and neck but sometimes extended to the trunk and limbs. In 1918-19 morbiliform and Scarlatiniform rashes were recognised. These were found most commonly in the initial stage of the disease, and were usually of transient duration; they were infrequently followed by desquamation, and it is possible that in many instances they were really drug rashes (e.g., antipyrin). Diagnosis was often very difficult.

A generalised measly rash may be seen, the face showing a mottled redness and the appearance being accompanied by conjunctivitis, coryza, and cough, though the latter phenomena may be absent; so also an extensive punctated or papular erythema resembling scarlatina in its being finely punctiform, but differing in its distribution over neck and face as well as trunk and limbs.

In several cases observed by me an exanthem was present at an early stage - anything up to the third or fourth day. It was polymorphous, assuming most often a diffuse erythematous form, varying from a bright red to a pale pink and localised on face, trunk, and arms, but rarely visible on hands and on legs. Desquamation did not follow. It was more suggestive of measles than of any other condition.

Erysipelas of face and trunk, with various local abscesses in the scalp, axilla, epitrochelear glands and thigh may occur, complicating the disease, but erysipelatous and also urticarial and petechial rashes, which have been described at length, are accidental like the others. Mixed rashes (e.g., of urticarial + erythematous character) have been seen, affecting principally the neck, shoulders, wrists, and dorsal aspects of the feet. Itching, without the wheals of true urticaria, is here present.

CIRCULATORY APPARATUS

INCLUDING BLOOD AND HAEMORRHAGES.

I. BLOOD: Pfeiffer's Bacillus has occasionally been cultured from the blood. Its presence is likely to keep up the temperature. In bad cases the superficial and deep cervical and axillary lymph glands are fairly constantly enlarged. The daily estimation of the total number of W.B.C. is important. At the height of the fever a distinct leucopenia (3,000-4,500 per c. mm.) appears to be a constant feature. In purely toxic cases the W.B.C. may be so low as 2,500-9,000 per c. mm. A moderate post-febrile leucocytosis (14,000-18,000 per c. mm.) follows as a rule on the third or fourth day. Leucocytosis generally heralds in a more favourable state (e.g., in pulmonary abscess formation, empyema, and other septic formations). The distribution of the different species is generally within normal limits.

Note: Whittingham finds that, where there is a "micrococcal" infection, a relative neutrophilia obtains during the leucopenia, followed by a slight increase of the small lymphocytes when the leucocytosis sets in; while the reverse holds good in cases of a "bacillary" infection.

II. HAEMORRHAGES: Haemorrhage from mucous surfaces is of very great frequency, there being in fact a general haemorrhagic tendency. This was especially observed in the height of the last pandemic. The vasomotor hyperaemia, characteristic of all the inflammatory phenomena occurring in Inf. gives rise

to extravasations. Moore quotes the remarkable haematolytic powers of the streptococcus as a causative factor, but the occurrence of the condition in epistaxis or haemoptysis is not by any means limited to the dreaded "pneumonic" or virulent type, or indicative of special liability in that direction. It is however possible that the streptococcus, pneumococcus, and Pfeiffer's Bacillus in association cause erosion of the mucous membranes by the very acute inflammatory process that obtains. Haemorrhage may, for instance, occur from rupture of the vessels in the hyperaemic laryngeal or bronchial mucous membranes.

Epistaxis: which has always been a recognised phenomenon, was in the last pandemic very common among children and adolescents. It would therefore be looked for more in the simple febrile type. In uncomplicated cases it may be present to an alarming degree, and may be difficult to control (bad cases may require plugging), but as a rule it is not of a serious character though liable to recur. The first occurrence is usually early. The condition requires further investigation, but it has been demonstrated that pus in the ethmoidal and sphenoidal sinuses, producing infection of nose, naso-pharynx, and accessory nasal sinuses - does render more liable haemorrhages from any of these mucous surfaces. It is sometimes associated with deafness or middle ear catarrh. There has been haemorrhage from the external ear, middle ear, and tympanic membrane indicating the acuteness of the inflammatory process.

Haemoptysis: this may be slight or may attain a degree comparable to that of phthisis. In the former case, blood is visible in streaks and splashes, and coming, as it may, from the larynx, lower part of trachea, or main bronchi, the mucosa of which is intensely engorged, the prognosis is not rendered worse. In the latter instance, however, the abundance of the haemorrhage is not a good sign, as it may indicate localised lung destruction. Haemoptysis is present in the pneumonic stage, but is also got in cases who demonstrate no pneumonia, but who are on the contrary up and about in 7-8 days. While common in the acute stage of infection, it is also sometimes seen in the apyrexial period of convalescence. Pleural effusion is frequently markedly haemorrhagic.

Haematemis and Melaena: Haematemesis is frequent in those cases in which vomiting occurs. The erosion of the gastric mucosa may be accompanied by very little pain. The vomiting of swallowed blood from epistaxis or haemoptysis must be excluded, as in cases of Melaena. In the latter there is the possibility of direct haemorrhage into the intestine. There may also be haemorrhage from the gums, root of tongue, and pharynx.

Haematuria: Apart from Nephritis this condition is probably rare. In definite acute Nephritis, as got in "pneumonic" cases, renal haemorrhages are common.

Haemorrhages into Muscles: Occasionally there is marked haemorrhage into the rectal sheath - sometimes throughout its length. The two bellies of the recti may rupture spontaneously,

"as cleanly as by an abdominal incision". Abscesses have been seen in some muscles.

Note: Probably the marked disease repeatedly noted in the rectus abdominis is initiated by haemorrhages. (Vide septicaemic type).

Haemorrhage into Skin: Purpura Haemorrhagica is rarely seen. Its appearance is usually associated with severe toxaemia. The extremities are involved, and the condition is said to be severe, with pain, tenderness, and swelling.

Uterine Haemorrhage: Undue bleeding from the uterus and haemorrhage from the vagina has been observed. The menses may be especially profuse, amounting to true menorrhagia. In past epidemics, as well as in the height of the latest, it has been observed that young girls menstruate before their time and girls who have never menstruated commence that function during an attack. Several cases of miscarriage at different periods of pregnancy, of which Inf. was undoubtedly the cause, came under personal observation. From very early records the tendency to abortions has been on record, and also cases of women who have passed the climacteric in which haemorrhages recurred unexpectedly. Where uterine carcinoma or fibroma exist there may be violent and alarming haemorrhage in course of an Inf. attack.

Note: It is thus obvious that in Inf. haemorrhages may be of the most various character, almost suggestive of Haemophilia. Haemorrhage into various organs, dura and pia mater, bones, and endocardium are rare.

III. CARDIO-VASCULAR: Inf. may affect the heart in several different ways corresponding to those of any severe febrile infection. The following facts may be taken to be

established:

(a) There may be direct invasion of the heart by the microbe.

(b) The toxins produced by the microbe may do hurt to the cardiac muscle directly or through the cardiac nervous apparatus, the latter more commonly.

(c) The rise of temperature (especially in hyperpyrexia) may greatly overstimulate cardiac action.

(d) Physical strain may also affect the heart tissues, as by injudicious premature exertion, especially where there has been any special strain upon the heart during the attack.

Affections of the heart are numerous and often severe. In severe cases the heart is usually weakened temporarily, and may be dilated. Coincident with the increase in size, systolic murmurs appear; the pulse becomes weak and variable and generally accelerated. These signs, however, may be but the expressions of an irritated heart and the temporary enfeeblement of the cardiac muscle. The condition may therefore pursue a favourable course.

P.M. examinations show that the heart is rarely the only organ affected.

> MacKenzie indeed has never seen any cases of Inf. in which the damage was limited to the heart alone, as in acute rheumatism, whereas peri-, endo-, and myo-carditis occur repeatedly along with lung complications.

The main change appears to be in the heart substance. In cases of death occurring from heart failure, other organs revealing no clinical signs of grave prognosis, Inf. probably produces a myo-carditis in a weak or susceptible heart. Nevertheless, different observers have found that patients suffering from chronic heart disease pass through typical attacks with

remarkably little detriment, the damaged heart maintaining a fairly efficient circulation in absence of complications. Such a case personally observed was the following:

CASE: A young ex-soldier with organic heart disease of some years' standing resulting from rheumatic fever, contracted Inf. of the Nervous Variety. The fever ran a typical course without his exhibiting any distress. At the height of the fever, the pulse was relatively slow and often dicrotic. The systolic B.P. was below 100 mm.: the diastolic was scarcely got. Ten days after resuming employment he had to give up and was found to have acute cardiac dilatation. Albumen appeared in the urine and there was a considerable haemoptysis. The condition cleared up under suitable treatment.

Recent endo- and peri-carditis are rarely found P.M. There is, however, likelihood - after a long and severe attack - of peri-carditis setting in. Here possibly other factors are introduced. Streptococci have been found in the peri-cardium. This suggests that peri-carditis may be septicaemic and the cause of death an intense and general intoxication, in which the heart suffers damage in common with other poisoned systems. In the main, it may be said that peri-carditis is not directly caused by the Inf. toxin. The fact that drugs of the digitalis group are powerless to tide the patient over a severe crisis in which the heart reacts badly (as in the Septicaemic type) bears out the likelihood of general systemic infection.

Cardio-vascular phenomena are also much in evidence in

cases of cerebral involvement, as shown by delirium, unconsciousness, etc. Here the pulse is often considerably slowed. (MacKenzie records a case of partial heart-block from this cause) suggesting a stimulation of the vagus by toxins acting on some part of the brain. When a patient shows such symptoms as the above, and is in addition pale, collapsed, and afebrile, death is almost inevitable, but it might well be said that the type was part cerebral, part cardiac. Such a case is in strong contradistinction to true septicaemic cases.

In critical cases the danger-signs are - a highly characteristic dusky hue and a very rapid pulse (120 per minute and upwards) with moderate temperature.

The early cyanosis is toxic rather than asphyxial. The cheeks are pallid but tinged with a peculiar blue colour, the lips dusky red, the tongue dark indigo, and the whole body of a lilac tint. This is often present for days before the fatal issue. Here, with moderate increase in the size of the heart, the sounds are soft and muffled and there may be systolic murmurs. The pulse, at first full but the individual beats weak and of low tension, gradually becomes small and thready. The patient is then "in extremis".

In autopsies in fatal cases of Acute Endocarditis during the pandemic, the bacillus Influenzae has frequently been obtained in pure cultures from small metastatic abscesses in the vegetations on the valves, and also isolated from the heart's blood, when it has been impossible to get it from the lung. In addition to the dilatation of the right heart, there

is got, not infrequently, intra-cardiac ante-mortem thrombus in the tricuspid valve between the R.A. and R.V.

> "Definite white tough adhesions entangle and enmesh the chorbae tendineae and columnae carneae".

This condition, as pointed out by Dickson, is one of the most important complications of pneumonia. Its significance is estimable when the so-called "syncopal type" of the older authors is examined. This occurs early in the acme of the attack in sthenic individuals, and is characterised by severe anginoid pain of a cramp-like character, attended by small thready pulse. Appearing alike in young adults and older persons, seizures may be acute and very alarming. There is often excess of urea, which some have held to account for the anginal phenomena by way of increasing arterial tension. Such cardiac attacks are commoner in broncho-pulmonary cases, not from organic disease, but in consequence of the unusually intense action of the Inf. toxins on the muscle.

The true cardiac type should not properly be associated with pneumonia - since the heart may collapse in cases uncomplicated by it - but the particularly insidious and dangerous form in which an apparent heart palsy does occur, is oftener than not seen with pneumonia. Here the very sudden "heart-failure" strongly suggests cardiac thrombosis (vide above).

The two main sympts. in cardiac Inf. viz: praecordial pain and cardiac syncope both occur in paroxysms, and are intermittent.

(a) Praecordial pains may be neuralgic or anginal. The former, usually a transient phenomenon, limited to the

praecordium, may be almost agonising, but without any obvious cardiac sympts. The latter radiate as in true Angina Pectoris and are of a much more serious kind. They may indeed end abruptly in fatal syncope due to "cardiac paralysis", or may be a persistent and serious sequel, occurring even in strong vigorous individuals in the prime of life with previously quite sound and healthy hearts, and are unquestionably of neuropathic or myopathic origin.

(b) Cardiac Syncope very often comes on suddenly, and is attended by a feeling of tightness and oppression. The radial pulse becomes almost indiscernible, the respirations are slow and shallow, the heart sounds distant, feeble, and irregular. There is a sickly feeling in the epigastrium, and the patient becomes pallid and collapsed, is overcome as by deadly weakness and may hardly have strength to whisper. Such must be regarded as direct heart-failure as against what Wynn refers to as "circulatory failure" (occurring in Inf. broncho-pneumonia) and in which, while the onset is also dramatic, there is depression of the medullary centre and consequent vaso-motor paralysis.

The <u>prognosis</u> depends on the patient's general condition in relation to the attack rather than to energetic therapeutic treatment directed towards the cardio-vascular system. The process of heart-exhaustion is usually delayed - the patient sinks by a gradual ebbing of the strength. Cases where fatty heart, or weak heart with damaged valves, or arterio-sclerosis previously exist, are necessarily of worse prognosis, whether the influence of the Inf. toxin on the nervous mechanism of the heart be the chief factor, or whether changes in the muscle are of main determining value, when the heart begins to fail.

The <u>after effects</u> of Inf. as applied to the circulatory system are remarkable.

The weakness following on Inf. while a notable feature, cannot be said to be entirely cardiac in origin, nor is it frequently even a sign of cardiac insufficiency. It is more

correctly the issue of injury to the central nervous system, but the heart shares the brunt of the attack with other systems. It may be well to outline such marked abnormalities as most frequently occur and which are generally attributed to purely cardiac causes. The most prominent complaint is the sense of fatigue or exhaustion, common to all debilitating illnesses. It is easily produced and may be anything from the mere absence of fitness to giddiness and faintness on slight exertion.

Breathlessness and palpitation, provoked by cardiac weakness, are frequent; discomfort or pain in the chest, especially the praecordia, may also be manifested. The pain is of a dull, aching character and while not necessarily produced by effort (physical or mental) is apt to be of a continuous character. These physical signs are, however, variable. There may be little or no increase in the heart's rate, at least when at rest, but even very moderate exercise e.g., assumption of the erect from the recumbent, may induce an undue rapidity. This is got in weakened hearts, in convalescence and febrile diseases. The nervous element is mostly pronounced in such cases; depression, irritability of temper, excitement over trivialities and certain vaso-motor influences - extremes of heat and cold - being among the most pronounced. Here it may be pointed out that syncopal attacks, which are by no means unusual at the onset as well as later, are often due to this cause alone, especially if sudden or sustained effort i.e., anything demanding physical and mental concentration - be indulged in. They are perhaps commoner in young

adults, in whom, however, the prognosis, for this reason is more favourable. Murmurs in different regions are common. These are general murmurs of debility, synonymous with anaemia, therefore systolic in time, soft and blowing in character and transitory in duration. A simultaneous increase in size of the heart is not infrequent; also the occurrence of recognisable irregularity due to extra-systoles. In pronounced cases there may be slight oedema of feet and ankles. Here also tacchy-cardia and arrhythmia are very often found to be independent of ~~the~~ detectable cardiac disease. Tacchycardia appears commoner in the early stages, and when present may be associated with hyperpyrexia. Bradycardia occurs more frequently in convalescence. In such cases the cardiac rhythm may be preserved, and the pulse may be quite regular.

The cause of tacchycardia (according to the most modern outlook on the nervous mechanism of the heart) is irritation of the sympathetic nerves or the intra-cardiac ganglia, just as bradycardia is caused by paralysis of the cardiac sympathetic nerves and ganglia.

> MacKenzie has indicated how "increased frequency of the pulse may be due to paralysis of the vagus, while conversely a decreased pulse-rate may be due to irritation of the tenth nerve."

In short, while the source and causes of irritation or depression of the cardiac mechanism are diverse, in the case of Inf. infection, general fatigue of the nervous system is probably the causa causans.

The toxic nature of the condition is particularly denoted by the characteristic nature of the pain which bears the

closest similarity to that induced in a digitalis-poisoned heart.

It has been seen that pericardial and pleuritic effusion may co-exist. Endocarditis is more frequently due to inflammatory processes in lung and pleurae, though it has been known to follow acute articular rheumatism complicating Inf.

Thrombosis of veins - especially femoral vein and the veins of the leg - is occasional, even with a mild, short attack. Phlebitis (brachial or saphenous) with painful swelling of the whole limb has occurred.

Cerebral thrombosis is also sometimes seen. Where the mid-cerebral artery is thrombosed, right haemiplegia with motor aphasia and agraphia result. The popliteal artery is sometimes occluded. As in veins the occlusion of the large arteries may be bilateral, affecting symmetrical vessels.

NERVOUS COMPLICATIONS.

While in the main the bacillus attacks mucous membranes, and its toxins the nervous system, the C.S. system may be infected directly by the Inf. bacillus as well as indirectly by its toxins.

It remains to deal with inflammatory phenomena of nervous distribution (meningitis, encephalitis, and myelitis) produced by invasion of the Inf. bacillus or synonymous organisms; and functional disturbances caused by the toxins produced by these organisms.

MENINGITIS: Primary fulminating Inf. Meningitis, which principally occurs in infants, originates first by dissemination - from blood stream or by lymph channels - of specific bacilli from their primary focus.

The convexity of the brain is the usual site and the involvement of the nervous system is indicated by intense headache, fainting, early stupor, and less often nuchal rigidity and Kernig's sign. Convulsions with opisthotonus and tetanoid convulsions of hands and feet mark the condition as being grave.

If the base of the brain is affected the condition is nearly identical with epidemic C.S. Meningitis. In Inf., the presence of herpes labialis and of bronchitis and expectoration are confirmatory, and the Inf. bacillus may be recovered from the sputum. The diagnosis is, however, chiefly based on the bacteriological examination of the C.S. fluid, in which the meningococcus flourishes. In Inf. the tension of the C.S. fluid on lumbar puncture is hyper-normal, but the fluid is usually sterile, though the bacillus Inf. has been recovered from it. Here, also, considerable improvement follows aspiration. Tuberculous Meningitis differs entirely in its insidious course, and in the absence of initial delirium, rigor, pyrexia, etc.

"Serous Meningitis" - occurring mostly in children - is a variety in which, after alarming meningeal sympts. of a few days' duration, the condition merges into a typical Inf. This abortive meningitis appears to be due to a hyperaemia of the

membranes of the brain.

Symes Thompson, writing of the epidemic of 1889-90, said that: "In children delirium was almost the rule." The causation in these cases of adult meningitis which died and in which cerebral sympts. were predominant, may have been sinus infections, as acute suppurative inflammation in the nasal sinuses, the upper air passages, and the ear, has been frequently found in nervous and pneumonic types.

ENCEPHALITIS: The "cerebral type" is distinguished from the purely nervous by the predominance of head sympts. e.g., vomiting, intense headache, restlessness, irritability, delirium, and even mania or delirium alternating with melancholia; or by purely convulsive sympts.

None of these sympts. taken individually, is of diagnostic value. In association, the sympts. enable one to form an exact clinical picture. True encephalitis - by which is meant acute focal haemorrhagic Inf. encephalitis - may follow, and may lead to various motor paralyses - hemiplegia or monoplegia, aphasia, and involuntary passage of the evacuations, and the case may terminate fatally in a few days. In 1918-19, delirium was very often observed in various phases. In fever, even of short duration, low muttering delirium with tremor, subsultus, and carphologia, and occasionally loss of control of organic reflexes were frequently seen, but such cannot be said to be more than characters of the typhoid state. Some were very noisy and active in their delirium, and in some very delirius cases the tache cérébrale was got. But this again is not diagnostic.

Paralyses of cerebral origin are distinguished by their sudden apoplectiform onset at the beginning or acme of the Inf. attack - very rarely indeed during convalescence - with high fever and grave cerebral sympts. (delirium, early unconsciousness, coma, epileptiform convulsions, Jacksonian epilepsy, etc.). Encephalitis may thus à priori simulate cerebral haemorrhage, embolism, or thrombosis, but the acute onset with rigors, high fever, youth of patient, and epidemic prevalence mark it off from such.

The condition is due to foci of capillary emboli, and to dissemination of the specific organism - which has been demonstrated in these areas - in the grey matter. It may be combined with haemorrhagic lepto- or pachy-meningitis. Distinctly cerebral forms are more frequently fatal, as was observed in 1918-19. Meningitis and encephalitis are certainly more often P.M. features. Should there be recovery, the sympts. resulting from the acute cerebral lesion are found to vary considerably, according to the intensity of the process, the position of the inflamed areas of the cortex, their number and size. Sufficient has been said to indicate the grave nature of such higher nervous system involvements.

Haemorrhagic encephalitis may under certain conditions, end in suppuration. In typical cases of abscess of the brain, the Inf. bacillus has been detected in the pus. Purulent encephalitis, which may be accompanied by purulent meningitis, is a condition secondary to purulent otitis, from suppurative processes in frontal, and accessory nasal sinuses and antrum

Highmori. Pulmonary abscesses and pleural empyema may also set up metastatic suppurating areas in the brain.

AFFECTIONS OF THE SPINAL CORD: (1) (2) and (3):

(1) ACUTE HAEMORRHAGIC MYELITIS with degeneration of cord is analogous to the multiple encephalitis described above. It sometimes occurs as a complication. Usually transverse cervical, it may be disseminated and accompanied by meningitis. Paraplegia follows, recovery being rare, as the spinal injury is usually extensive and of a grave type.

(2) ASCENDING MYELITIS and LANDRY'S PARALYSIS, - a fulminant variety of the same, due doubtless to toxic affection of the lower motor neurone - are almost invariably fatal. It seems likely that the bacillus Inf. can produce a spreading meningo-myelitis, such an inflammatory process being mostly of a very acute and severe nature.

(3) ACUTE ANTERIOR POLIOMYELITIS and HERPES ZOSTER, - which resembles it in character, but affects the posterior root ganglia instead of the anterior horns - are other forms of spinal disorder that may complicate Inf. In elderly patients, herpes zoster may be followed by neuralgia of an indescribably painful form.

CASE: Such a case personally attended was that of a woman (aet. 47) in whom a particularly severe neuralgia followed upon herpes zoster. The hyperaesthesia was intense and extensive. It occurred nearly simultaneously at three levels. The uppermost was at the base of the neck, chiefly anteriorly (probably a cervical posterior root), the middle and lowest

each respectively following the course of one of the upper and lower dorsal cutaneous nerves - anteriorly and posteriorly. All affected the left side.

Tingling, pain and tenderness were also felt over the face, forehead, and side of nose, along the distribution of the fifth nerve, but at a slightly later period, and unaccompanied by eruption. It seemed likely that twigs of the nerve, rather than the actual nerve-trunk, were here involved. The three levels showed three crops of vesicles, which were preceded by the usual pain and redness of the skin. This, however, merged into neuralgic pains of the severest description, requiring morphine hypodermically. In this case neurotic heredity and a series of recent deaths in her family from Inf. played some part in causation, but the patient was not affected to the extent of breaking down mentally. The condition proved very obdurate to treatment, though there was no trace of trophic disorder. The non-official salicylate of quinine eventually relieved the distressing pains, but the tender points remained indefinitely, despite massage and galvanic treatment.

As a sequel to Inf. there may also develop Paralysis Agitans, Spastic Spinal Paralysis, Disseminated Sclerosis, or Progressive Paralysis - diseases which, incipient but unnoticed, would in all probability have appeared sooner or later in any case, but less rapidly. The course and perhaps, if primarily latent, even the attack of cases of typical Syphilis at the quaternary stage (Locomotor Ataxia or General

Paralysis) is similarly precipitated.

INFLUENZAL EPILEPSY, etc. Epilepsy following upon Inf., and particularly encephalitis, generally ends in recovery, but recurrent seizures, sometimes of an aggravated form, may continue. Epilepsy or other forms of insanity may appear, after years of intermission, during an Inf. attack. Typical post-Inf. Chorea has been observed in children. "Toxic tetany" and other conditions of spasm probably combine an element of Hysteria, of which all forms have been observed after Inf. It has been seen that the usual depression of spirits may be mild or severe, and with insomnia and melancholia, may become established. Post-Inf. Neurasthenia generally has the characters of the hypochondrical variety.

PSYCHOSES: Many Inf. psychoses occur in apparently healthy individuals without hereditary or other stigmata. The development of a psychosis seems to depend more on the poisoning of the cerebral cortex by the specific nervous toxin, than on any condition of nervous exhaustion.

> Leichtenstern remarks that "prodromal afebrile delirium and initial psychosis protect from dementia during convalescence rather than predispose to it".

This tallies with the findings in the last pandemic, in which psychoses less rarely developed out of the febrile delirium, the commencement usually following hard on the heels of the Inf. attack or a few days after. A psychical syndrome with mental confusion and melancholia has been typical of many cases in the last pandemic. Three types predominate:

(a) Melancholic type: with stupor, fear, total dumbness, refusal of food, ideas of persecution.

(b) Maniacal type: with fleeting ideas, psychic exaltation and motor disquietude up to destruction or maniacal fury. Acute mania with homicidal tendencies is very much less common than hypochondriasis with suicidal bent.

(c) Type of Hallucinatory Confusion: with delusions of poisoning, etc. The insane ideas are chiefly of a morbid, depressive character.

The duration of psychoses is frequently short, but in severe cases may be protracted to weeks or months. The prognosis is as a rule very hopeful, except where there is a hereditary or neuropathic taint, or a history of chronic alcoholism.

In the Paris epidemic of 1890, the suicides increased 25 per cent, a large proportion of the excess being attributed to the extreme nervous prostration caused by the disease.

> Dr. Rawes stated that "of insanities traceable to Inf., melancholia is twice as frequent as all other forms of insanity put together."

Thirty years later, especially in the terminal stages of the latest pandemic, mental disturbances - apart from the more profound cerebral sympts. and graver disturbances of the mind - were common.

> The "jaundiced mind" is here almost characteristic. In the words of Sir John Moore "the mental state of the convalescent is often intensely subjective or self-conscious."

Certainly of all infectious diseases Inf. seems to be the most likely to be followed by mental disorder. The etiology of the latter, which, it must be remembered, is generally of a favourable type, is connected with two processes - a febrile state, primary in origin, and a toxic state, usually following

the fall of temperature, both producing a very decided degree of nervous and of mental exhaustion. In adolescence, the climacteric, child-birth, and the puerperium - in fact all critical periods in life - and also sometimes after operations, Inf. acts with greatest potency upon the nervous system. In persons who have had "nervous breakdowns", or attacks of insanity, Inf. appears to produce a reversion to the former type of mental unbalance. In degenerates, a moral rather than intellectual falling-away is sometimes noticed. In individuals "on the borderland" and in men who had suffered from shell-shock, Inf. sometimes produces much mental disorder. In one case - in which however a certain degree of cortical damage probably existed - definite mental deterioration set in (it is described in the Case-Appendix).

PULMONARY VARIATIONS.

(a) When the bronchitis dominates - the so-called "Purulent Bronchitis" - the bronchi are first intensely red and injected. They become blocked with a purulent, glutinous exudate, spreading into the bronchioles. This may cause an actual sucking-in of the intercostal spaces. The patient usually looks obviously ill and suffers from respiratory distress due largely to defective supply of oxygen. There are, in the main, scattered noisy rhonchi on auscultation, but not entirely general. A high-pitched resonant note is obtained on percussion.

(b) The so-called "Influenzal type of Pneumonia" is

merely a spongy condition of the lung - "a diffused congestion with impaired entry".

(c) It sometimes happens that the lung affection is a Mixed lobar and broncho-pneumonia.

(d) Cases of Classical Lobar Pneumonia show on the whole a more regular fever, but they frequently terminate by lysis. True lobar or croupous pneumonia is of a very severe and frequently fatal form. It usually appears in the post-febrile stage or during convalescence, and, although a specific disease, is often erroneously ascribed to "catching a chill through going out too soon". Generally it is of the asthenic form and is characterised by insidious onset; lassitude; early delirium; subsultus tendinum; prostration; soft and unequal pulse and tendency to adynamia and collapse. It is indicated by its lobar distribution, large area of hepatisation, and by its fibrinous exudation. Pain in the side and a pleural rub are common at the outset. Except for the super-addition of the typhoid state, the "asthenic type" of Inf. bears some comparison. Here the temperature is rarely above 101°F. - generally below that; pulse often weak and often slow, and in many cases not reaching 60 per minute. This slow pulse, when combined with a rise of temperature, is practically pathognomonic of the disease.

(e) In some cases, in which the acute attack of pneumonia is recovered from, a prolonged condition ensues after the fall of temperature. The patients continue dyspnoeic and cyanotic and the diffuse râles persist all over the chest. Large amounts

of purulent material continue to be expectorated. X-ray photographs of the chest show scattered shadows throughout the lungs, while the general condition distinctly improves, the patients feeling physically much better. This is often the starting point of Bronchiectasis. Gangrene is not unknown. Here the offensive smell of the sputum directs attention to the dangerous condition.

(f) Another very formidable and not altogether uncommon late complication, or rather sequel, is Post-Influenzal Pulmonary Tuberculosis. The more usual manifestations of pulmonary tuberculosis are exhibited, including the positive bacillary sputum. A tuberculous family history is frequent. The onset varies from 2-3 weeks to 4-5 months, and may begin with a haemoptysis. While some cases may have been tuberculous from the outset (transient and irregular febrile attacks occurring in an epidemic often being put down to the prevailing malady), there seems little doubt but that tuberculosis is frequently a secondary condition and late complication.

Many apparently weak individuals, including phthisical patients, have recovered, while more robust individuals succumb. It has been stated that advanced phthisis confers an immunity against Inf., but this has by no means been proved. In sanatoria, the infrequency of Inf. was due rather to the prophylactic hyper-ventilation, etc. Leichtenstern points out that such cases frequently acquire pneumonia (a condition very rare apart from the presence of Inf.). There seems no question but that pre-existing tuberculosis is exacerbated by an attack

of "grippe", Activated Pulmonary Tuberculosis may become

i. Miliary.

ii. Miliary of Lungs.

iii. Tuberculous Basal Meningitis.

Cases with crepitant or subcrepitant râles from base to apex, back and front in both lungs, and without bronchial breathing are indistinguishable from generalised pulmonary tuberculosis. It seems likely that the great diminution in resisting power to both acute and chronic infections, accompanying the convalescent stage of Inf., may determine the first onset of any fresh infection, just as the less considerable prostration following on measles and whooping-cough in early life may predispose.

TOXAEMIC OR SEPTICAEMIC TYPE.

Inf. may simulate Septicaemia, but in cases of a grave character Septicaemia may dominate the picture. Where the septicaemic factor is of relatively greater weight than the pulmonary factor, there are certain features which render the attack distinct from other forms. Such cases are <u>always serious</u>. Evidence from France and America, as well as from this country, showed early in the last pandemic that Inf. can kill rapidly by toxaemia. The organisms from infected cases are frequently pure streptococci, or mixed e.g., pneumococci, and different streptococci. Such give rise to different complications e.g., confluent broncho-pneumonia, empyema, pulmonary oedema, and capillary bronchitis. These, be it noted,

are secondary infections, the initial infection apparently being chiefly due to the bacillus Inf.

In the majority of cases, however, the pulmonary and septicaemic factors are combined, varying according to the particular nature of the pulmonary involvement, but fundamentally the same type of disease. This type is marked out by acute and severe onset, nearly always accompanied by vomiting, high fever, rapid pulse, and hurried respiration. The patient is flushed, heavy-eyed, anxious-looking, and obviouslly ill from the commencement. The duration is from 3-5 days. Where the infection runs a fulminating course, it may prove fatal in one or two days, or even eight hours after the onset. In any case the onset is explosive, and the course precipitate. In the main a profound toxaemia is absolutely uncontrollable and refractory to all treatment. The 1918-19 pandemic, which killed its victims with such appalling speed in different Continents (<u>vide</u> pp. 41-42) apparently owed its frightful mortality to a fatal toxaemia of strepto- or pneumo-coccic origin.

The clinical picture is that of acute primary toxaemia, or septicaemia rather than that of broncho-pneumonia. Often there are very few signs in the chest, except of diffuse emphysema or of bronchitis down to the capillary tubes. In the later stages the dark flush merges into a peculiar and characteristic lilac-coloured cyanosis, affecting face and neck, but most marked over lips and ears. This feature is not confined to the septicaemic type, but is frequently seen in severe cases of the pneumonic or broncho-pneumonic variety. It is however unlikely

that the condition could be got in cases where the septicaemic factor is not, comparatively speaking, dominant. The prognosis in every case is practically hopeless, and once it has set in, death usually supervenes within 48 hours with suffocative sympts. There may be no obvious physical distress. The patient is, however, conscious he is going to die. Cerebral sympts. are not usual, consciousness being fairly well retained almost to the end. The patient lies low in bed with head well back, teeth parted, hollow sunken cheeks, rapid sighing respirations, incontinence of urine and faeces and uneasy movements. Insomnia, raving delirium, tremor, dry black tongue, sordes on lips and teeth indicate the profoundness of the system-poisoning. Subsultus tendinum with twitching movements of the hands and arms and picking at the bedclothes may also be observed (typhoid state). A restless coma may precede death, with complete oblivion to surroundings. If this state is prolonged, there may be a sickly "graveyard smell" about the bed.

Though broncho-pneumonia may either develop in Inf. cases as an after-complication, or be present from the beginning, in the height of an epidemic cases beginning mildly and later developing various pulmonary signs are in the minority. It seems reasonable to judge, both from clinical and P.M. evidence, that in the typical pandemical fulminating attack of Inf. pneumonia there is nearly always a toxic element. This negatives expectant or prophylactic treatment to a great extent, and probably accounts for the reason why prompt use of a stock vaccine - composed of the likely organisms (bacillus Influenzae,

pneumococcus, and streptococcus) - fails so often even to abort an attack of this dangerous variety.

In cases where the patient is intensely lavender-cyanosed, dyspnoeic, and lethargic, where the skin becomes icteric with almost a P.M. tint, where the pulse is slow, and toxic sympts. steadily increase, there is only the remotest chance of recovery, even if anti-streptococcic serum be administered early. In some cases the benefit has been only temporary, the toxic condition lapsing into the pneumonic, but in more favourable cases the toxaemia may be reduced, as evidenced by the delirium clearing and the appearance improving, though the physical chest signs remain unaltered. Such cases as recover initiate improvement by profuse sweating, with lessened fever, stronger pulse, and loss of stupor. The appearance of subcutaneous abscesses of pyaemic nature has been known to herald in recovery.

The following case is an illustration:-

CASE: R.T. (Insurance Agent, aet. 29).

Seen on the third day of illness, the patient, a well-developed muscular man, presented a general cyanosis, approaching heliotrope, this being diffused all over the body. Respirations were up to 40, but the patient had no true dyspnoea. The alae of the nostrils were dilated, and the mouth slightly open, but he did not need to be propped up in bed, nor had he apparent difficulty in getting his breath. The pulse was rapid (120); the B.P. rather low than otherwise. The urine was highly concentrated and contained a recognisable amount of albumen. There was no cardiac dilatation.

Practically no cough existed, and no sputum. The condition appeared, therefore, to be due neither to cardiac nor respiratory involvement, but to a purely toxic state. Administration of a multivalent vaccine, oxygen, and stimulants was not followed by any definite amelioration in the severity of the sympts. There was a partial delirium, sometimes extreme tremor. The patient could not swallow; the tongue was brown, dry in the centre, moist and dirty at the edges. The breath was foul and there was a general mal-odour about the patient. On the fourth day suffocating dyspnoea, uncountable pulse, and breathing, 50 to the minute, was evident; also the outbreak of a clammy sweat. A fatal issue then rapidly supervened.

Apart from bacteriological examination, further evidence of septicaemia exists in four remarkable clinical features much noticed in the last pandemic:

(a) Purpuric Patches or Blebs, which may appear on face, back, chest, or limbs (vide Skin).

(b) Subcutaneous Interstitial Emphysema-crackling of the deep tissues elicited by palpation, and sometimes associated with pain and coincident with an acute haemoptysis. This usually begins in the neck and spreads up to the malar eminences over chest and sometimes over back, abdomen, and whole body. It has been suggested that it is due to a gas-forming organism (Dawson), but other observers (Kelman) put forward a combination of causes:-

i. A toxic action of the germ on the lung tissues causing weakening of the alveoli, perhaps abscess of the alveolar walls.

ii. Toxic action of the virus on the respiratory centre, producing dyspnoea and cyanosis, which are sufficient to induce emphysema.

Note: A case of subcutaneous emphysema in a parturient woman, personally attended, during an Inf. period bears a strong similarity. The day before labour set in, she had travelled the breadth of England. The

condition started at the base of the neck and the front of the thorax towards the axilla. It spread rapidly three parts round the neck with a slight swelling, and also spread down to the right mamma. The confinement was precipitate, but normal, and the condition was not observed until the following day. This did not appear to interfere in any way with the patient's comfort or progress, although the "crackling" was deep and well-marked.

(c) A characteristic stench exuding from the body as a whole. It has been referred to as an indescribable foetor in even the mildest cases; in very severe cases as almost overwhelming. It is said to disappear before complete recovery of the patient.

(d) Abrahams, Cole, and others record the not infrequent spontaneous rupture of one or both rectus abdominis muscles, due to degeneration of the muscle primarily, and violent coughing efforts secondarily. The rupture - bilateral or unilateral - generally occurs below the level of the umbilicus (vide haemorrhage into muscles).

CASE APPENDIX.

I. Simple Febrile Influenza - delayed.

CASE: A.R. (Bank Clerk, aet. 25). A history was given of a severe cold preceding the actual fever period by rather more than two days. The patient deferred taking to bed. She was seen on probably the third day of the illness, on which day her temperature reached a maximum of 104°F. The pulse was a little weak and its rate increased without exceeding 116-120, while the respiratory-rate showed but little acceleration. In addition to headache and general aches and pains, she complained of sore throat. The palate and anterior fauces were red and injected, but there was no obvious swelling. Other catarrhal signs, in the chest and elsewhere, were as good as absent. No gastro-intestinal sympts. were present, except those usually associated with febrile disturbance, viz., heavily-furred tongue, loss of appetite, and constipation.

After subsidence of the fever, which came down on the eighth day by lysis, the patient began rapidly to recover her normal strength, declared herself perfectly well, got out of bed for a short time, and moved about, without actually leaving her room. The following day she went out of doors for the best part of an hour. That evening there was a revival of the pyrexia. It set in with shivering and sneezing,

and rose to 101°F. A small degree of catarrh appeared at both lung bases behind, with faint subcrepitant râles but without dulness or bronchial breathing. There were a few scattered rhonchi in front and pain was felt along the margin of the ribs, and also in the abdomen, midway between the umbilicus and symphysis pubis, but without marked tenderness on pressure. Slight albuminuria was present.

This slight fever continued in an erratic fashion for several weeks. Convalescence was accordingly tedious and protracted. Without feeling really ill, the patient was poorly and good-for-nothing. She suffered from considerable languor and mental depression, during which time all interest in life was gone; she did not care to read, sew, or eat, and became thin and anaemic. She did not sleep well, and at night perspired a good deal. This painful condition lasted for nearly three weeks, during which time there was marked loss of body weight.

Note: It is noteworthy that the respiratory sympts. were originally unimportant - a dry pharyngitis and a little coryza. The secondary rise of temperature was a relapse. The duration of the primary, the onset of the subsequent pyrexia, after apparent recovery, and the excessive prostration and exhaustion as well as the slow restoration to health, were probably attributable to three radical errors:-

i. Neglecting to go to bed early enough;
ii. Getting up too soon i.e., before the acute stage of the disease had fully passed.
iii. Leaving the house before convalescence was completed, when also her resistance was reduced to a minimum.

II. Catarrhal Respiratory Influenza:

CASE: L.G. (Domestic Servant, aet. 27). The invasion

was sudden, with shivering, a general feeling of misery and weakness, coldness along the back, coryza and catarrh of the upper air passages, also intense pain referred to the back of the eyeballs, increased by the slightest movement of the eyes. Seen on the second day, catarrhal sympts. were well developed - sneezing, running at the eyes, (which were seen to be somewhat injected) and in addition to gingivitis and stomatitis, a certain degree of congestion of the pharynx and simple tonsilitis. The patient complained of considerable pain in the fauces, dryness and soreness, and also of stiffness of the nose. On blowing the nose even gently, there was on each occasion smart bleeding. On the evening of the second day, when the temperature attained its maximum reading of 102°F., a hard dry cough of a troublesome paroxysmal character, with little or no secretion, set in. This was worse at night and in the morning some spitting of bright blood from the pharynx occurred. There appeared to be tracheitis. Breathing was accelerated. The patient began to suffer a little from shortness of breath, a slight sense of oppression in the chest with rawness in the region of the sternum. This in combination with a dull, congestive headache, interfered with sleep. After a day or two the sputum, which had been scanty and tough, became muco-purulent, but not very abundant. It was more easily brought up and was slightly blood-streaked. On examination of the chest, the physical signs were those of acute bronchitis. Sticky crepitations were audible at the bases of both lungs, and at

an early stage sonorous and sibilant râles. (Later on, moist râles predominated with a normal percussion-note).

At this stage a spotty roseolous rash made its appearance. It seemed to mark the height of the condition. The slight dyspnoea went, the cough ceased to worry the patient, and the whole condition had cleared up in 9-10 days, with the exception of a few moist râles, which persisted for a considerable time at the posterior bases. The stage of convalescence was prolonged by reason of several attacks of syncope.

III. Influenzal Broncho-pneumonia - fatal.

CASE: T.M. (Blacksmith, aet. 41). In the early stages of the Inf. attack there were very few visible signs - in fact there was no means of distinguishing the condition from that of many other catarrhal respiratory cases, except that, on the whole, the onset was more severe, and the fever during the initial stages attained a higher level. The sputum was scanty, glutinous, and blood-streaked. Pulse and respirations were not greatly accelerated. He slept fairly well and took his nourishment.

Towards the close of the third day, when one was beginning to look for a fall of temperature, it rose to a slightly higher figure, and the patient became in consequence rather distressed. The skin was hot, dry, and pungent. At this stage the pulse and respiration-rate showed a greater deviation from the normal. Chilly sensations were felt and pain became pronounced. Physical signs were negative. The sputum was more purulent and rather nummular, but not very abundant.

Next day, the patient looked more dull and apathetic and exhibited some cyanosis of lips and ears, the change of colour apparently coming on in a few hours, and deepening rapidly. Almost from the first appearance of the baleful heliotrope element, he looked desperately ill, reminding one of ghastly cases of "gassing". Oxygen, administered continually, yielded no advantage. On this morning, fine sticky crepitations were heard at the end of inspiration over both bases, particularly the right. At first distant, and inconstant, they were certainly more obvious by the afternoon. The individual respirations were rapid, short, and shallow, and if exertion of the slightest kind were made e.g., coughing, or turning in bed, breathing became audibly embarrassed. On the fifth day the physical signs in the chest consisted of, here and there, fairly good resonance, but slight areas of dulness and modified areas of respiration were manifested. These became speedily intensified with râles, areas of definite tubular breathing, and accentuation of V.R. The whole was suggestive of a wandering consolidation, but the evidences remained somewhat indefinite till the evening, when the areas of pneumonic consolidation became more wide-spread and considerable. Up till then the patient had remained fairly cheerful and clear-headed. Now he began to ramble. The complaint was chiefly of the chest which "felt raw", and which coughing irritated, the pain being complained of down the front of the manubrium sterni, and on the left side in the anterior axillary line about the level of the sixth and seventh ribs.

On the morning of the sixth day the breathings became noisy and stertorous, consciousness was completely lost and it was obvious that the terminal phase was reached. Before the last the patient's temperature fell rapidly, the skin was found to be cold and clammy, and he was unmistakably moribund. Death occurred before noon.

Note: Intra Vitam:-
Blood cultures - one early, one late - were negative.
Leucocyte count - Leucocytosis at onset, later, Leucopenia.
Throat swabs and sputum - Bacillus Inf. and pneumococcus and micrococcus catarrhalis mixed.

Post Mortem:-
Bacteriological report of micro-organisms from cut surface of lung - small gram - positive diplococcus (supposed to be an intermediary between the pneumo- and strepto-coccus).
The mucous membranes of trachea and larger bronchi were found to be swollen and intensely congested and coated with a sero-muco-sanguineous exudate. As compared with the slight physical signs during life the striking feature P.M. was the wide extent of the pulmonary lesions. Both lungs showed splenisation, patchy areas of consolidation from the size of a pigeon's to that of a hen's egg. The pneumonia appeared to have begun at the base. On section these areas bulged slightly. In colour they tended to a dark red, though around the bronchial passages they were lighter, approaching to grey. At one or two places there was a tendency to abscess formation. On squeezing the sectioned lungs, a sero-muco-sanguineous exudate appeared at the mouths of the larger bronchi. There was also acute inflammmation of the smaller air-passages. The mediastinal glands were enlarged and congested. So also the superficial and deep cervical and axillary lymph glands. On the right side appeared the beginning of a sero-fibrinous pleurisy, a little suggestive of the lighting up of old pleuritic adhesions. The heart was soft, with engorgement and slight dilatation of the right side. All the viscera showed congestion, but no other morbid changes. There were no changes in the alimentary canal or the brain.

Note as to Etiology:-
It has been stated by different authorities that the action of Pfeiffer's Bacillus is chiefly confined to the production of lesions of the tracheal and the

bronchial systems, though rarely it may also cause diffuse pneumonic lesions. While the primary infection is due either to Bacillus Inf. or, as has been urged, to a filterable virus, the Bacillus Inf. appears to be more frequently met with the earlier the case is observed. In this case - which both from clinical and P.M. findings is by no means a-typical - the fatal condition appeared to be a contagious broncho-pneumonia, due to a variety of pneumo- and streptococci affecting a patient already infected with the Bacillus Inf.

IV. Nervous Type of Pneumonia - Delirium with Psychosis.

CASE: N.C. (Ex-carpenter aet. 27). This patient was evacuated as a case of shell shock, and seen by me first five days after evacuation. He had been buried by a shell explosion, and was also suffering from a long, deep scalp wound, caused by a shell fragment. This lesion healed up quite normally. The characteristic phenomena of shell-shock had in great measure abated when he developed Inf. The only prodromal sympts. - if such they may be called - were extreme depression and bad dreams, which, at the time, were put down to the original cause. A peculiar dazed look and apathy before the actual onset were noticed by his nurse. He became suddenly and acutely ill. His temperature rose rapidly to 104°F. Active delirium set in with physical as well as vocal violence, lasting day and night, but at night-time more of the low, muttering type. At times he was aggressive, requiring force to keep him in bed, shouting, struggling, fighting, kicking, biting and screaming. On administration of $\frac{1}{100}$ gr. hyoscine the excitement diminished.

There was a fast pulse, dry skin, tongue and lips, and teeth covered with sordes, and catarrhal sympts. of the

simplest type. The pupils were normal. The reflexes were also normal except the knee-jerk which was sluggish and difficult to elicit. The condition, however, became aggravated by loss of control of the bladder and partial loss of control of the rectum. Despite tepid sponging, the temperature remained about 103.2°F. for four days, then came down by lysis. During the acme of the fever he was in a state of semi-delirious mania, with few lucid intervals, in which he complained of insufferable headache, refused food, craving only for water. After the fall of temperature the incontinence improved; he slept much and was encouraged in this respect. When awake, however, though the delirium had gone, he remained incoherent and displayed hallucinations of sight and hearing. He still refused nourishment and became emaciated, but later consented to be fed with a spoon. It was considered probable that there was at this time either disturbance or loss of the senses of taste and smell, probably perversion, as he appeared nauseated at both sight and taste. The C.S. fluid was clear, culture being negative.

After about six weeks - during which time he remained much about the same - he began slowly to improve, but remained inattentive to nature's call, indifferent to his surroundings, only vaguely remembering his wife, and his child not at all, being sometimes almost stuporose and at others quite conversational, though in a meaningless, chattery fashion. Though given opportunity, he was unable to occupy himself at his former trade, which, later, worried him much. He was depressed,

dissatisfied, moody, and restless,with recurring attacks of insomnia, and he had also pretty constant headaches, and reversions to his recent melancholia.

Being a Canadian, it was resolved to send him home in the hope that a sea-voyage, a good nourishing diet, and familiar faces and surroundings might ultimately aid in his recovery. He was said to be quite a moderate drinker. Alcohol in the form of brandy was administered during his febrile state, but was dropped after the fall of temperature. The condition was, latterly, that of profound nervous (and physical) exhaustion with an element of melancholia introduced, but when last seen the insane habit seemed to be in some measure established. Memory was, however, partially recovered.

Note: It is noteworthy that the violent delirium was associated in great measure with a high temperature. There appeared to be no neuropathic family history. Any neuropathic predisposition was acquired - owing to the very recent condition of shell shock - not hereditary.

The cerebral cortex, in particular the frontal lobes, suffered from severe toxaemia due to the Inf. infection, and the function of the grey matter was probably permanently damaged by the poison.

S U M M A R Y.

The historic as well as the practical value of the preceding Sections lies in great measure in the comparison of the findings of the last pandemic with past epidemics as recorded by authorities of dimmer therapeutic ages. From the concordant testimony of the foregoing accounts, certain important conclusions have been established. These will be now given in brief:

I. Primary Inf. is a uniform disease, having "at all times and in all places borne a stamp of uniformity in its configuration and in its course, such as almost no other infective disease has." In view of the complexity of the various forms, this sweeping statement by Hirsch requires modification, but at least the disease presents the same general characteristic phenomena in every epidemic, such as suddenness of onset, rapidity of dissemination, and as below stated. Certainly of all epidemics it seems the least liable to essential modification by altered hygienic conditions in the habits and life of man. (Thompson).

The salient features of a primary epidemic of Inf. are:-

i. A very high attack-rate.

ii. An approximate symmetrical evolution in time.

Primary Inf. is furthermore regularly characterised by:-

(a) Pandemicity - the occurrence of pandemics has never

yet been anticipated, nor can Inf. be said to be periodical.

(b) A special incidence upon persons in the prime of life. No age is exempt. In certain epidemics the aged have been more liable, in the last epidemic children, and young adults - persons over fifty being almost immune.

(c) A low case-mortality. While varying much in degree, the fatality of Inf. is far slighter than the severity of the sympts. would lead one to suppose. There is, however, a marked tendency to modify coincident disease, or to predispose individuals in the affected district to other diseases, so that its influence is really more widespread.

(d) A variable age-mortality. In earlier epidemics old age was a factor which determined life and death in the broncho-pneumonic complications of Inf. In the recent pandemic the young and healthy were carried off. This remarkable difference has yet to be explained. It may be due to a difference in the relative proportions of the micro-organisms, or in the amount of the filterable virus, or it may, and probably is, the resultant of a relatively higher incidence, and not due only to a higher fatality-rate. Infants certainly possess a congenital or natural immunity to some extent.

(e) Contagiousness. Scattered individual cases are invariably antecedent, though in consequence of the low fatality of primary Inf. early mortality-records are usually lacking. Its transmission from person to person and its dissemination through human intercourse may be taken to be equally established facts.

All cases of Inf. are infectious in the incubation period i.e., before they are recognised or even suspected, there being no prodromal stage. Every one of the enormous number of mild ambulatory cases and of "carriers", so common in all epidemics, is a possible disseminator of "droplet-infection", the fomite of the disease.

II. Primary Inf. is independent of both Climatic and Meteorological Conditions. Epidemics have occurred in literally every quarter of the globe and have commenced at every season of the year, with high or low temperatures, steady or changeable weather, much or little atmospheric moisture.

III. Though the normal routes of infection are the nose and throat, and though respiratory complications are the most

common and the most dangerous, as has been noted from the Middle Ages, Inf. without catarrh occurs in perhaps 25 per cent of cases. Gray (1872) was one of the first to describe such.

IV. Despite the uncanny capriciousness of its varied phases and manifestations, several well-marked Types and Sub-types are recognisable.

V. The variations of the same disease on different occasions of its epidemic prevalence are very considerable. Every visitation, although characterised by the predominance of some one variety, generally presents examples of each, besides in some instances exhibiting phenomena peculiar to itself.

VI. The Scale of the 1918-19 pandemic was magnified by the phenomenal migration of nations, and by the unfavourable hygienic conditions to which the majority of the world had been recently exposed, but there was no clear-cut, formal, or unique difference from the 1889-90 outbreak.

VII. Spread. When Inf. is carried by ships, the sea-ports show signs of the infection before the interior parts. This was demonstrated so far back as 1782, but was particularly observed in 1918-19 in the harbour cities of Australia (Sydney), India (Bombay and Karachi), S. Africa (Durban and Cape Town), as well as at the congested Channel seaports.

VIII. Susceptibility varies greatly, but the conditions that influence it are still matters of conjecture. Workers in gas fumes showed a certain amount of immunity as compared with other classes of the community. The only real immunity is to

be found in complete isolation e.g., segregated groups, as the Dogger fishermen, and Lighthouse keepers, and inmates of such institutions (especially in comparison with the staff) as asylums, gaols, convents, etc. Conversely the epidemics tend to begin in crowded communities, such as public meetings, in busy centres, barracks, depôts, camps, schools. The recurrence of epidemics of Inf. is, however, not dependent on overcrowding.

IX. A short-lived Immunity apparently does follow Inf., synonymous with that succeeding pneumonia, or possibly rheumatic fever. Evidence from the 1918-19 pandemic is not lacking to show that the waves of a pandemic, after attaining the acme, tend to decline greatly in both incidence and severity; the germs after having passed through innumerable generations losing a great part of their virulence and contagiousness.

X. Cause. While it is unquestioned that epidemic Inf. is produced by a specific organism or organisms, yet in scarcely any other disease is met with such a variety of lesions and complications produced by various organisms, of common occurrence apart from Inf. Whether the essential cause, therefore, is due to the Bacillus Inf. (Pfeiffer), to a mixed infection, or to an undiscovered virus - probably ultra-microscopic - it seems certain that the general resistance of the bronchial mucosa is lowered thereby, permitting bacterial growth to extend to the finest tubules.

XI. Treatment. Medical Science has not so far discovered a positive prophylactic, the use of which could be enforced by

the State. A small daily dose of quinine might perhaps be said to have a definite anti-toxic action on the specific virus, but oral asepsis - irrigation of mouth, fauces, and nasal passages with antiseptic and weak saline solution - is probably of greater value. Personal and domestic cleanliness - especially as respects the disinfection and disposal of sputum and nasal discharges - is also a reasonable preventive measure. With regard to the most modern methods, inoculation with a multivalent vaccine, or with serum - plain horse serum or anti-streptococcic serum, the latter method inducing leucocytosis to deal with the pathogenic organism - is still uncertain in its results. We are thus compelled to depend on a judicious employment of symptomatic treatment and a sound application of general principles.

Isolation, rest and warmth in bed, and quiet during the attack are prime essentials. While draughts are to be scrupulously avoided, plenty of fresh air is desirable. So also the avoidance of chill or fatigue during convalescence, when all the vital powers are low. At least three a-febrile days before the patient gets up at all should be insisted on, and then three clear days up and dressed, with relative inactivity before any return even to light employment. Light diet and avoidance of bodily and mental exertion are wise measures, especially till albumen has disappeared from the urine.

With regard to drugs, aspirin, grs. X t.i.d., till temperature becomes normal is helpful, especially in the nervous variety. Turner holds that if the patient early in the disease

be "drenched with salicin" the infectivity of that patient seems to be destroyed and the attack aborted. But antipyretics have to be used with care, owing to the risk of heart failure. Very mild attacks rarely require more than an early purge, and a few subsequent doses of quinine sulphate, but in severe cases the fever, pain, depression, insomnia, etc., all require special attention. In the initial stages of Inf. opium appears to be more nearly a specific than almost any other drug. The form personally most largely used was as follows:-

Pulv. Doveri gr. X to XV and two vegetable aperient pills (No. 13 Army Pill) or Calomel.

A good night's rest is ensured if the patient is kept in bed well covered with blankets. The temperature is reduced by the free action of the skin and great relief from aches and pain ensues. The aperient counteracts the nauseating and constipating effect of the opium. Generally a quinine mixture (effervescing) is given afterwards. Relapses under this treatment were rare. The use of opium, however, is not indicated in every case.