"M E A S L E S"

T H E S I S

f o r

T H E D E G R E E O F

D O C T O R O F M E D I C I N E

o f

G L A S G O W U N I V E R S I T Y

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M E A S L E S.

SYNONYMS.

Morbilli - from "morbillo",- i.e.. the "little disease" the term being first used in Italy to distinguish it from the "great disease" or plague, which was known as "il morbo".
Rougeole - French designation.
Masern) German designations.
Flecken)
Rosolia - A term in occasional use in Italy.
Serampion - A Spanish synonym.

ETYMOLOGY.-

How exactly the disease came to be termed "measles" etc., is not well understood. The writings of the Arabian physicians as well as smallpox - which they were the first to scientifically describe,- make reference to an acute exanthematous disease by name "hashbah", which they regarded as a modified form of variola Rhazes - "Liber de Variolis et Morbillis, & "Centinens", lib xviii, Cap viii, Brix., 1486, fol, Bl. viii "De re Medica", lib x, cap. xviii, opp. minor, Basil, 1544, p. 304 lib. divis., cap. clix, opp, e.c. 444; Ali Abbas - Liber theor"., sermo viii, cap 14, & Liber pract"., sermo iii, cap. 1 - here the disease first termed rubeola; Avicenna - "Canon", lib. iv, fen. T. tract. iv, cap. 8; & Avenzoar - lib. ii, tract viii, cap ii). The same disease likewise encountered amongst the writings of authors in the Middle Ages under such designations as Morbilli (diminutive of Morbus),"rubeola" (Ali Abbas - loe. cit), "rossalia", "rossania", "rosajia" (Concorregio - "Practica de Variolis et Morbillis" in "Summula de curis febrium", venet., 1521, fol. 938) "fersa" or "Sofersa" (Michael Scotus - "de procreatione et hominis phisionomia", Cap. x; and Gruner - "De Variolis et Morbillis fragmenta", Gena, 1790, p 33: Milanese), "Mesles (Johannes Anglicus - "Praxis med"., Vindel, 1595, p. 1041), thereafter the English "measles" from the German "maal". The resemblance to the German "Masern" of the Sanskrit"Masura", - spots, is noteworthy. Skeat (Etymolog. Dictionary) connects the word "measles" with the Dutch "maselen" and holds that it would have been written "maseles" in the fourteenth century, or thereabout. Creighton (Lancet 1896, vol 1., p.1096) insists upon the derivation of the word being from "miselli", a diminutive of "miser" - a term applied to lepers, and accounts for its extension to measles by stating that John of Gaddesdon had confounded the eruption of Measles with"the broad dusky red spots on the legs of 'pauperes et consumptici' "

The French "rougeole" and the Italian "rosalia" both refer to the colour of the Exanthem; and the Latin term "morbilli" is a comparison of measles with Small-pox.

DEFINITION.

Measles is an acute, highly contagious, epidemic disorder, occurring in childhood or early adolescence;; characterised by a peculiar papular eruption occurring usually upon the fourth day of the attack, and spreading over the entire surface of the body in 36 hours; preceded and accompanied by marked fever and catarrhal symptoms in the eyes, nose and respiratory passages.

Although the main features are subject to variation, that tendency is less often noticeable than in scarlet fever and small-pox.

The disease usually can be readily distinguished by the occurrence of the peculiar eruption - following contagion, and the catarrhal pneumonic symptoms. But few individuals of the human race are exempt from the disease, which, however, usually, attacks them only once in their life.

As it is generally children who are affected with measles, and as it is a disease accompanied by very dangerous symptoms, in many cases, it becomes an important object of domestic attention; and we shall, therefore, give a pretty full description of the malady from its various standpoints.

HISTORICAL SUMMARY.

We have no certain knowledge as to the antiquity of measles; but we do know that, ever since the eighteenth century, it has continued to exist in epidemic form.

Study of the ancient records demonstrates the probability of measles having been introduced into Europe about the same time as small-pox, and its following in its wake. For long, indeed, it was supposed to be only a variety or modification of that disease, and as such it was described by Rhazes (Liber de Variolis', and 'Continens', lib. XVIII. Cap. VIII, Brix,, 1486, fol. Bl. VIII) and other Arabian authors. Avicenna ('Canon', lib. IV, fen. I, tract. IV, Cap 8.) considered Measles as a sort of bilious small-pox. Sennertus, in 1640, and Diemerbroeck, in 1687, maintained the identity of small-pox and measles. Sydenham dispelled this illusion by the accurate description which he gave of the disease as it prevailed in London in 1670 and 1674. For nearly a century afterwards, however, it was imagined by many that a pathological affinity existed between measles and scarlatina. This was distinctly avowed by Morton in 1696, nor was it until nearly the year 1793 that all traces of this doctrine vanished. To the history of measles given by Sydenham very little has been added by more modern authors. For the few additions which have since been made we are chiefly indebted to Willan in 1800. Several species of measles have been described by nosologists, but they are all referrible to one - the rubeola vulgaris of Cullen; the other forms which measles assumes being only modifications of this, arising either from a peculiar condition of the atmosphere, or the constitution of the individual affected.

ETIOLOGY.

Measles is essentially a contagious disease, as well as an infectious (with the exception of whooping cough the most so of all the specific fevers) disease, being transmitted from person to person. In this way it is the most infectious of the exanthemata; and no person can be said to be exempt from an attack unless having previously suffered from it; and, even then, a second attack is of no great rarity - proving that the immunity conferred is anything but absolute. Its infectivity (using the term in its broadest sense) is, however, of a much more restricted kind than is observed in scarlatina and variola as it is no t transmitted so readily by fomites, or similar intermediate agencies, to which the contagium does not usually adhere for any appreciable period, so as to be carried by the same or protected person: being furthermore exempt from atmospheric transmission, quarantine of contacts may be expected to stay it propagation (Richard - Therap. Gaz., July 16. 1888)

According to Bard (Rev. d'Hyg. et de Police Sanitaire, May 20. 1891) contagion is always direct from person to person; and cessation of the disease in a locality leaves no trace of the contagion in its wake: so obviating any necessity for disinfection of the patients' residences.

The contagiosity of measles is obvious from recorded epidemics of which that-described by Panum and Hoff (Sundhedskollegiets Aarsberentning, 1876 -) occurring at the Faroe Islands (after an immunity of 65 years), in 1875, affords an instructive illustration. From 1781 to 1846, there had been no cases of the disease observed there, until the latter year, when it was carried from Copenhagen - to almost the entire populace (6,000 out of 7,782) - by the crews of the boats in the employ of the Danish Government, only those persons coming into actual contact with them contracting the malady - as proved by tracing (of) their movements and particular relationships. Panum states

that in his visits to these 17 of the 20 islands - during a period of four months - he observed that th e disease was introduced by a cabinet-maker, who had visited friends suffering from measles just before leaving Copenhagen; contracting the disease, and communicating it to two of his friends at Thorshavn - the chief port of the Faroe Islands: fromwhich the epidemic commenced - its propagation being invariably consequent upon individual contact - direct or indirect: the incubatory period averaging from 13 to 14 days. The disease was afterwards carried to another village (Tjornvig) by ten persons, all of whom had been in contact with sufferers from measles (on the 4th of June) but only once in the society of each other: the characteristic eruption developed on the 18th of June.

Prior to 1875, and since 1846, there had only been one epidemic, viz., in 1862, which, however was prevalent in only one place and affected nearly 25 persons. In 1875 an epidemic was seen to be raging in the Shetland Islands, with which the inhabitants of the Faroe Islands did considerable fishing trade, the disease being ultimately introduced into the port of Vestmanhaven by the sick members of the crew of an English fishing smack who had been in contact with cases elsewhere, until 1123 cases of measles had occurred; and so on until it raged over other distant islands of the Faroe group. The contagiosity of measles is similarly evidenced by the epidemic which occurred in Fiji, in 1875, where the disease had never before been observed - more than one-fourth of the population dying from it in three months.

The great value of quarantine as a preventive measure was well demonstrated during this epidemic, as any family or village could prevent outbreaks by remaining isolated respectively from other villagers or villages - 1500 persons who made the experiment entirely escaping the malady, and many of the islands as well. Similar proof as to the utility of quarantine is afforded, moreover, by the epidemic which occurred at the village of Hagelloch, on the outskirts of Tubingen, where a labourer was able, by isolating his children from chance infection, to prevent them contracting the disease (Pfeilsticker - Beitr. z. Pathol. der Masern, u.s.w., Tubingen, L.F.Fues, 1863, p. 10) In the same place the extreme infectivity of the disease in children was apparent by the fact that out of a total of 196, as many as 185 were attacked by it.

Measles has at times been observed to partake of the nature of a pandemic, as from 1834 to 1836, when it raged over almost the whole of Europe; and from 1842 - 1843 when the malady prevailed throughout Russia, France, Germany, Holland and Switzerland (Hirsch - Geograph & Histor. Path. vol T).

EPIDEMIC RECURRENCE.

The supposedregularity of epidemic prevalence in certain localities and large cities - said to be every two years - has never yet been demonstrated, the intervals between each in recorded observations exhibiting the widest variation as seen from the following statistics:-

A. Intervals between epidemics at the City of Tubingen

138 weeks)
144 ")
201 ") ... 6 epidemics from 1874 to 1893.
184 ")
131 ")
63 ")

B. Intervals between epidemics at the village of Lustnan.

208 weeks)
175 ") ... 4 epidemics from 1876 to 1893.
188 ")
211 ")

According to Whitelegge's statistical compilation for

Great Britain, the intervals between epidemics are held to be about two years; and about once in ten years, an epidemic of unusual severity and great mortality, has been noticed to occur: in certain instances, the death rate from measles being double or even treble the ordinary.
It has frequently been noted how, like small-pox, measles has entirely vanished from a locality or country wherein it has raged epidemically or pandemically for as long as three years at a time: some of the more notable instances were; in England, Germany and France, the epidemic of 1796 - 1801; in North America - 1801, in Great Britain - 1807 - 1808, Germany - 1823 - 4, Netherlands and Germany - 1834 - 6, Northern and Central Europe - 1842 - 3, Switzerland, France, Netherlands, Germany and Russia, - 1846 - 7, Northern and Western Europe, North America and Germany- 1862 -63.

Many local epidemics have been observed in various countries, and the periodicity of these many writers have endeavoured to establish, the intervals being variously calculated, e.g; (a) Every two or three years at Munich - Ranke (Jahrb f Kinker., 1869, ii, p 34), and at Hallemann - (De morbillis epid. Halis obs., Hal., 1848) (b) every three or four years: Spiess - at Frankfurt-on-the-Main - (Jahresbericht Med. der Sladt Frankfurt. a, M., 1867); At Meran - Geissler (Viertel. f. Oeffentl, Gesund., 1871, iii, p 34); At Stuttgart - Kostlin (Arch. des Vereins f. Wissensch. Heilk., 1865, ii, p 328); At Canterbury - Rigden (Brit Med Jour. Apr. 1869, p 348); and at Aleppo - Guys; (c) Every four or five years: at Gratz - Macher; and (d) Every five or six years:- At Groningen - Thuessink; at Osanabruck - Bartscher (Jour. f, Kinderkr., 1866, XLVII, p 28); and at Bedford - Blower (Assoc. Med. Jour. Nov. 1857, p 924).

The significance of these figures (quoted more for the purpose of illustration than else), however, cannot be considerable, as at most other places no such regularity of recurrence was observable; e.g, Measles prevailed at (a) Erlangen (Kuttlinger - Bargr. Aerztl. Intellig., 1860, p 20) in 1819 - 25 - 31 - 39 - 47 - 52 - 56; (b) at Christiania (Fordhl. i. det Norske Med. Selskab. i., 1868, Christian., 1869, p 10) in 1824 - 28 - 33 - 39 - 47 - 56 - 61 - 67; (c) At Basel (Hagenbach - Jahrb. f. Kinderh., 1875, IX, p 56) in 1824 - 28 - 31 - 32 - 34 - 35 - 36 - 38 - 44 - 49 - 54 - 57 - 60 - 61 - 62 - 64 - 67 - 69 - 70 - 73; whereas the epidemic interval from 1823 - 1848, at Prague (Opper - Allgen Zeit. f. Epidem col 1876, ii, p 275) was as long as four years, and at the same place from 1848 - 1860, only two years, but afterwards of annual recurrence in epidemic form.

A great variety of opinion has from time to time been expressed on this interesting question, and with no approach to unanimity. Goldschmidt of Oldenburg (Haser's Arch. f. Med. 1845, VII, p 303) for instance, whose exper--ience as an epidemiologist must have been enormous, disclaims altogether the theory of the epidemic recurrence of measles in anything approaching regularity; Scherzer states that the disease was only three times epidemic in Cape Town from 1800 - 1860 (1807, 1839, and 1852); Rufz, of Martinique, observed an epidemic prevalence every ten years, 1831 - 41 and 1841 - 51), whereas Chapman and others deny having seen any regularity of return in the United States of America.

Susceptibility to Measles.

The disease, though usually occurring in epidemics, has often been observed in sporadic form, especially in the larger Cities, (~~is usually encountered in Epidemic form~~) - and in certain instances with a more or less approach, with regard to its prevalence, to regularity in return. As a

rule, when once measles has entered a street or building, all (unprotected by a previous attack) suffer from it, and in nearly every instance, children, the susceptibility of whom to the disease is remarkable, only 1 per cent of these - according to Biedert (jahr. f. Kinderh., vol XXIV, p 94) - escape it. The same has been observed in large buildings (schools and hospitals) where once an incipient case is admitted, the whole of the juvenile population is attacked, the adults escaping owing to their having already, by having had the malady in childhood, acquired immunity.

Meteorologic

Efforts made to establish a relationship between this and the epidemic prevalence of measles have, so far proved futile.

Geographical Distribution

The prevalence of Measles is world-wide; and unrestricted to any climate, of which it is absolutely independent; although its occurrence most often during the winter months cannot be gainsaid; ~~though~~ yet, nevertheless, of the nature of a coincidence. On the introduction of measles into a country or community previously free from it, the disease appears to assume an extraordinary severity.

From the historical records of measles in remote ages, it seems clear that the disease was somewhat widely distributed over almost the whole of Europe and Asia, and from the middle ages to the eighteenth century, when the disease came to be recognised with greater certainty from the many ailments which had formerly been diagnosed as morbillic. The disease cannot be regarded as having any particular habitat, for, as mentioned, it is indiscriminately distri--buted over both hemispheres.

In Europe, for instance, the disease is distributed pretty evenly from the Mediterranean coast to the extreme North, although from the comparative infrequence with which the latter region is visited by human beings, the disease is not so often encountered there - the circumstance being of more apparent than real importance. The epidemics of the Faroe Islands - in 1781, 1846, 1862, and 1875, and the importation of the disease from Shetland, are dealt with above. The same circumstance occurred in Iceland, in 1664, 1694, 1846, 1868 and 1882 (manicus - Bibl. for Lager, 1824, i, p 32; Panum, ibid., 1847, i, p 319, & Virchow's Archiv, i, p 492; Madsen - Sundhets - Colleg. Aarshertning for 1876, p 572), as well as on several occasions in Lapland (Report in Sundhets - Colleg. Berattelse, 1852, p 30) - all from direct contact of the infected with the healthy, measles being non-existent during inter-epidemic periods.

With regard to the Southern regions of Europe, the disease has been noted to be quite as common in Greece (Olympios - Bayr. Med. Corresp. 1840, No 12), Roumania (Barasch - Wi. Me. Woch., 1855, No 36; & Leconte - Consider. sur la pattiol. des. prov. du bas - Danube, Montp., 1869, p 45) and Turkey (Rigler - Die Turkei, &c., ii, p 26; and Beyran - Gaz. Med. de Paris, 1854, No 22, p 342), as in other parts of the Continent, and elsewhere, e.g, Asia Minor (West New York Med. Rec. Mar. 1869 p 27) the Caucasus (Liebau - Petersb. Med. Jahrb. 1866, xi, p 281)., Mesapotamia and Syria (Tobler - Med. Topog. von Jerusalem, Berl. 1855. p 46; Guys - Statistic du Paschalik d'Alep., Marseille, 1853, p 63; Floyd - Lancet, 1843, ii, p 4; and Robertson - Edin. Med. & Surg. Jour. 1843, July p 57), Arabia (Palgrave - Union Med 1866, No 20, p 308) Persia (Polack - Wochenbl. der Wien. Aerzte, 1857, p 721), India (Twining - Clin. Illustr., ii. p 432 - for Bengal; Shortt - Ibid., 1866, Apr. p 221 - for the Madras Presidency; Kinnis - Edin. Med. and Surg. Jour. 1851, Apr. p 316; Morehead - Clin. Researches i, p 329 - for the Bombay Presidency; Don - Bombay Med. Trans. 1837, iii, p 10 - for Sind; for the North West Provinces; McGregor - Diseases in the North West Provinces of India, p 213, and Evans - Edin. Med. Jour.

1855, Aug. p 175; For the Himalaya Regions: Ireland - Ibid, 1863, Jan. p 613, and Curran - Dubl. Quart. Jour. 1871 May, p 311; and, for Ceylon: Davy - Account of Ceylon), China (Pearson - Calcutta Med. Trans. 1833, vi, p 362; Morache - Annal d'hyg., Jan. 1870 p 25, and Dudgeon - Glasg. Med. Jour. July 1877, p 328), Japan (Gaigneron - Arch. de Med. Nov. Apr. 1866, p 279), Egypt (Pruner - Krankh. des Orients, p 122; and Hartmann - Skizzen des Nillander) Tunis (Ferrini - Sul Clima di Tunisi, p 153) Abyssinia (Blanc - gaz. hebd. de Med. 1874, No 22, p 349) Algiers (Guyon - gaz. Med. de Paris, 1839, No 46, 1842, No 34, p 536, Bartheraud - Med. des Arabes; Gaucher - Gaz. Med. de l'Algerie 1869 No 3. p 34) West Coast of Africa (Daniell - Dubl. Jour. of Med. Sci. Aug. 1852, and Mannerot - Malad. endem. a Gaboun; p 40), Senegambia (Gautier - Endemies au Senegal, p 18; and Chassaniol - Arch. de Med. Nav, May 1865, p 506) Cape of Good Hope (Black - Edin. Med. and Surg. Jour. April, 1853, p 266; Scherzer - Zeit. der Wien. Aerzte, 1858, No 11 p 166; and Egan - Med. Times and Gazette., June 1873, p 681 and Sept. p 355) Madagascar (Davidson - Med. Times and Gaz. Dec 1868, p 648) Mauritius (Lancet, June 1875, p 865) Reunion (Dutroulan - Traite des malad des Europeens dans les pays chauds, Paris, 1861, p 51) and St Helena (Lesson - Voyage med. autour du monde, Paris, 1829, p 149; and McRitchie - Calcutta Med Teans. 1835, viii, app xxix.

The disease seems to have invaded the Western Hemisphere soon after the arrival of the first Europeans there, and in the East Coast States of the Union; from thence with the Colonists Westwards to the Mississippi Valley, and throughout Kentucky and Ohio (Drake - Diseases of the Valley of North America, ii p 586) North America seemed to haved enjoyed entire immunity from measles until the years 1829 and 1846, when it appeared in Oregon (Moses - Amer. Jour of Med. Sci., Jan 1855 p 38) and California (King - Ibid. Apl. 1853, p 389) respectively, as we ll as being imported into the Hudson Bay Territory (Smellie - Monthly Jour. of Med. Sci. Dec. 1846, p 413) in the latter year. Greenland seems to have escaped measles until 1864 (Lauge - Gronlands Syrdonisforhold, p 37) where it then exerted its potency to a remarkable degree.

The advent of measles into Central America is uncertain; and the epidemics seem to have been of rare occurrence and with about three decades between them, the first being probably either at the end of the eighteenth, or beginning of the nineteenth centuries, for certain localities at least, e.g, Mexico (Stricker) Hamb. Zeit. f. Med. 34 p 529; Porter - Amer. Jour. Med. Sci. Oct. 1853, p 321; Bouffier - Arch. de Med. Nav. May 1865, p 533; and Heinemann - Virchow's Archiv. 1873, Vol 58, p 161) Honduras (Hamilton - Dubl. Quart. Jour. Aug. 1863, p 105) Costa Rica (Schawalbe - Arch. f. Klin. Med. 1875, xv, p 344) and the West Indies (Chisholm - Essay on the Malignant Pestilential Fever, &c, London, 1801, i, p 61; Hunter - Observations on the Diseases of the Army in Jamaica, Leip. 1792, p 225; and Rufz - Gaz. Med. de Paris, 1857, No 54, p 532).

Some time during the sixteenth century the disease became (coincidentally with variola) epidemic in Brazil (Sigaud - Maladies du Bresil, pp 111, 200, 373; and Rendu - Etudes Med. Sur. de Bresil, p 66) from which it soon spread to Chili (Vide - Arch. de Med. Nav. Aug. 1864, p 103; and Boyd - Edin. Med. Jour. Aug. 1876, p 110) Peru (T. Schudi - Pest. Med. Woch. 1846, p 729; Smith - Edin. Med. & Surg. Jour. Apr. 1840 p 335; and Arch de Med Nav. Sept. 1864 p 188) and the River Plate districts (Brunel - observ. Med. p 37, Dupont - observ. Med. sur la Cote orientale d'Amerique, Montpellier, 1868, p 14; Mastermann - Dobell's Reports, Lomdon, 1870, p 382.

It was, however, not until the middle of last century that measles became imported into Australia, its first outbreak being observed at the Hawaiian Islands in 1848 (Gulick - New York Med Jour. Mar. 1855) so that by the year

1854 it became more or less generalised over the Australian Mainland, , New Zealand (Tuke - Edin. Med. Jour. Feb 1864, p 721) and Tasmania (Hall - Trams. Epidemiol. Soc. 1865, ii, p 70); and since then epidemics have occurred, with considerable frequency, both there, and on adjacent islands, as: the Marquesas (Vide - Arch. de Med. Nav. Oct. 1865, p 284) Tahati (Dutroulan - Traite, p 57), and the Fiji Islands, (Lancet - June, p 865, and Julyp 33, 1875; and Squire - Med. Times and Gaz. Mar. 1877, p 323). The only notable epidemic at New Caledonia, of which we have any record (Vinson - Topogr. Med. de la Nouvelle Caledonie) was the first which occurred in 1858; since then, the country seems to have been peculiarly free from measles.

Season.

Of the 530 epidemics (mentioned in Hirsch's work) in Europe and North America, 339 (63.7%) occurred during the colder months of the year, and 191 (36.3%) during the warmer.

The Registrar General's returns for 1838 to 1840, and from 1849 to 1853 (England and Wales - 30,836 cases) show that the numbers for that period were:-

Months	Cases	Percentage
January to March	8106	26.3
April to June	8907	28.9
July " September	6610	21.4
October to December	7213	23.4

The slight (almost infinitesimal) influence of the cold season upon epidemicity, is still further brought out by Hagenbach's statistics for Basel, where eight epidemics out of eleven epidemics occurred during the winter and three during the summer, ("Epidemiologisches ans Basel" - "Jahr. f. Kinderh" vol ix, pp 46 et seq) - 354 cases proving fatal, and as follows:-

Months	Cases	Percentage
January to March	92	25.8
April to June	183	51.4
July to September	38	10.7
October to December	43	12.1

or, otherwise expressed:-

Months	Cases	Percentage
The 6 colder	188	52.8
" 6 warmer	168	47.2

This apparent favouring of the spread of the contagion during the colder months, is probably due to the closer contact and congregation of individuals during that time, and we may feel certain therefore, that the disease is quite independent of climatic influences. In spite of the distribution of measles over the globe, and the occasional exemption of certain districts from its ravages, as well as what has just been noted regarding its independence of climate, certain kinds of weather appear to have a consider--able effect upon the frequency of outbreak and the extent of its prevalence, the cold season, par excellence, being most favourable to its existence: this has been observed in all climates, the world throughout,. According to various writers, epidemics of measles occur in India and Brazil from February to April, i.e, in the cold season; in Persia, Egypt and Turkey, measles is most prevalent in the Spring and Autumn; at the Cape in the Autumn from April to June; in North America, Switzerland, (Hoffmeister - Schweiz. Zeit. f. Med. 1849 p 471), Prague, and Roumania, towards the close of the Winter and during the Spring. The following table mentions the mortality returns of Measles in England and Wales from 1838 - 1840 and 1849 - 1853:-

Period	Months	Fatal Cases
1838 - 1841	January to March	8,106
	April to June	8,907
and	July to September	6610
	October to September	7,213
1849 - 1853	Total	30,836

The following table compiled from the statistics of 530 epidemics of measles (in Europe and North America) shows clearly the preference of measles for the cold weather:-

In Autumn.....32)	
In Autumn and Winter.....52)	
From Winter to Spring.....15)	
In Winter.....62)	i.e, 339 in the colder months.
In Winter and Spring.....74)	
F rom Winter to Summer.....27)	
In Spring.....77)	
In Spring and Summer.....81)	
From Spring to Autumn.....26)	
In Summer.....38)	i.e, 191 in the warmer months.
In Summer and Autumn.....36)	
From Summer to Winter.....10)	

Of 213 of the above epidemics:-		Season
Acme of prevalence attained	48 times	Autumn
" " "	59 "	Winter
" " "	76 "	Spring
" " "	30 "	Summer

The nature of the influence of the cold weather upon measles can hardly be explained: the greater congregat-ion of human beings at that season, whilst in theory feasible, is somewhat questionable as a definite reason, in that the same ~~degree~~ dependance upon the season of the year has been observed as conspicuously in the tropics, where crowding of human beings into close rooms, and so forth, is unusual.

Soil

The nature of the soil has nothing to do with the propagation of measles, the occasional destructiveness of which has never yet been satisfactorily explained upon the virgin soil hypothesis; and that in spite of its first introduction into Fiji having led to the death of one-fourth of the inhabitants: but not being unusually severe amongst those who were nursed and cared for on modern lines.

Race.

All races of mankind are equally, and universally, susceptible to measles; no one race suffering more severely from it than another, the susceptibility of negroes to it in the United States being more apparent than real, as appears from Drake's statement that, in 1854, whites, negroes, and Indians, were indiscriminately attacked, after the disease had once spread throughout the United States, where previously only scattered cases had occurred. At times then, when measles appears to exert its greatest virulence amongst the coloured races, this may be safely presumed to be wholly due to the unfavourable nature of their existence.

Immunity.

One attack of measles nearly always confers immunity for life; and (as in small pox, Chicken Pox and Scarlet Fever) second attacks in the same individual are extremely rare: a third attack is more or less of a clinical curiosity. Most instances of a so-called second attack, or apparent relapse, are nothing more nor less than either German measles or erythema, both of which have been frequently mistaken for rubeola. Thomas (Beitz. z. Kentniss der Masern - Arch. der Heilk. 1867) during an observation extending over forty years, never once encountered a second attack in the same person; and this has been the exp erience of Panum (Virchow's Archiv. i, 1848), Willan (Diseases of the Skin, London 1808) and others of immense experience. The writer has himself suffered from measles twice, and has

observed in practice a second attack in two authentic instances; and these have been recorded by others - most of the cases being observed either shortly after the original attack or not for many years.

Many authorities absolutely deny the existence of an immunity: Bohn (Ueber Morbilli Adultorum Deut. Med. Woch. 1888, p 332) for instance, states that it has never been, and cannot be proved that a supposed immune person (who passes through an epidemic unattacked) has not in reality suffered from measles in childhood - the attack at the time being perhaps so slight as to be unnoticed; and that apparent immun-ity is in reality nothing less than a lack of opportunity for infection.

The susceptibility of a person to measles seems to exhibit considerable variation; for instance, it is by no means infrequent to find a nurse pass unharmed through one epidemic and contract the disease in another one. The writer has frequently observed this variation of susceptibili-ty in the case of medical practitioners. Generally speaking however, everyone may be regarded as practically susceptible to measles, those escaping possessing an uncommon amount of vital resistance in the presence of an exposure to a comparatively weak virus.

The following statistical summary of the morbidity at Thorshavn, Vestmanhavn, Kollefjord and Sandwaag demonstrates these points more fully:-

	Attacked by measles				Not affected	Those remaining unaffected lived	
		Epid-emic of 1846	In 1862 or at some other time	Epid-emic of 1875		In same house with measles patients	In the house where there were no measles patients
Thorshavn	930	417	1	506	6	1	5 (in three separate houses)
Vestmanhavn	315	111	22	139	43	..	
Kollefjord	222	92	..	120	11	1	10 (in five separate houses)
Sandwaag	166	35	2	117	12	5 in 1 house	7 (in three separate houses.
Total.	634	655	25	882	72	..	..

Immunity in Childhood.

That a partial or temporary immunity exists in the case of almost every infant, during the first five months of its life, and from the rarity of its exposure to infection at that time, it is obviously somewhat difficult to prove from statistical compilations. This theory attains a fair ap-proach to substantiation from the epidemic of 1847-8 (hist-orian Pheilsticker) at Nagellock, a hamlet near Tubingen, with a population of some 500 persons, 197 being below the age of fourteen. Of these latter, 185 suffered from measles, but only three of the older inhabitants, the same being all three of 15 years of age, and immunized by a previous attack. The morbidity to age, in the case of the very young children, may be tabulated thus:-

Age	Total number of children of this age.	Number who contracted the disease	Number remaining unaffected
2 months	2	-	2 (1 was isolated)
3 "	2	-	2
4 "	2	-	2
5 "	1	-	1

Age	Total number of children of this age	Number who contracted the disease	Number remaining unaffected
6 months	2	2	-
7 "	3	3	
8 "	1	1	-
9 "	1	1	-
10 "	3	3	-
1 year	14	14	-
2 "	18	16	2 (1 was isolated)

The following statistical compilation of Bartel's, (Bemerkungen uber eine im Fruhjahre 1860 in der Poliklinik in Kiel beobachtete Masernepidemie u.s.w., Virchow's Archiv, Vol xxi, pp 26 et seq) shows the proportion of cases of measles to various ages, and will serve to supplement the foregoing. It comprises 673 cases which occurred during the epidemic at Kiel, commencing with the month of March, 1860:-

Age	Number of cases	Percentage
Under 1 year	31	5.4%
Between 1 and 5 years	274	47.8%
" 5 " 10 "	226	39.4%
" 10 " 15 "	32	5.6%
" 15 " 20 "	4	0.8%
" 20 " 30 "	3	0.7%
Over 30 years	3	0.7%

No useful purpose can be served by endeavouring to prove a comparative susceptibility after the first or second year at which time a full susceptibility to measles is established, any apparent immunity after that period being due entirely to lack of opportunity for infection, as has been already instanced in the cases of the epidemic at the Faroe Islands, where all persons, regardless of age, sex, and so forth, contracted the disease, no one escaping it after exposure to the infection. A person failing to contract measles in childhood, can only attribute this to his avoidance of the contagion. Numerous instances of this are on record but apart from it, some authors contend that certain nervous diseases - especially of the brain - have the power of immun-izing the individual against measles, or at least to considerably modify the illness from the latter - more especially in a diminution of the pyrexial manifestations.

We may take it, therefore, as a certainty, that no age is wholly exempt from measles; and that, generally speaking, it is rarest in infants under one year (especially from 1 - 5 months) and in elderly persons. To specially substantiate our former contention, moreover, we have the statement of Mayr (Measles "p 40) that of 10 nurslings exposed to infection, one only contracted the disease. Barbillier's report of the epidemic at the Bordeaux Foundling Hospital(Schmidts Jahrl, 92 p 90) is instructive, in that it instances 33 children between 1 and 7 years of age of whom 24 were attacked by measles, whilst of 40 children under 1 year, only 7 suffered.

According to Bartscher, attacks of sucklings under six months of age were of very rare occurrence in Osnabruck. According to Mayr, only one fell ill in 10 among the new-born and nurselings. About this time (1860) Bartels saw 274 patients between one and five years of age, but only 31 under 1 year; nurslings frequently escaped altogether. Bronn saw, in an epidemic at Leith, among 170 cases of which 129 were less than five years of age, only 12 patients under one year; 24 from 1 to 2 years; 49 from two to three years; 22 from three to four years; 22 from four to five years; and 18 from five to six years. In Pfeilsticker's epidemic, except three totally secluded children, only 8 escaped, of whom 7 were six months old or less. Spiess recoded only 15 cases in the first year, and 52, 68, 62, 81, 71, 82, in each of the following years of life; Tressling - 72 in the first year, and 147, 142, 151, 139, 189, and 198 in each of

the later years; - Kellner - 18 in the first year; and 61, 84, and so on, in the next; Gummers - 11 in the first year and 30, 33, 25, 25, 24, 22, in those following, out of 251 patients under fifteen years of age. According to Geissler, there fell ill in Meerane, in 1861, out of 2,926 not previously affected children, 1,754 or 59.6 per cent; the proportion of children under three months was 12.7 per cent; from the third to the sixth month of age, 56.5 per cent,; from four to five years 70.9 per cent; from five to six years 77 per cent; from 7 to 8 years 81.3 per cent; from eight to nine years 78 per cent; from nine to ten years 68 per cent from ten to eleven years 55 per cent; from eleven to twelve years 30.1 per cent; from twelve to thirteen years, 20. 8 per cent; and from thirteen to fourteen years 63.6 per cent. It should be noted that most of the children having had the disease, the figures of the latter years are based upon small numbers; they are consequently of little value, partly for this reason and partly because at this age of the children the parents might have forgotten an attack that had occurred a long time before.

Occurrence of Measles in Old Age.

The finding of measles towards the end of life is exceptional: Drake encountered it at eighty, and Michaelton at 83.

Second Attacks.

A second attack is not of comon occurrence. The writer during a study of numerous epidemics, has met with it in three individuals. He believes his finding to be unique. Panum (loc. cit.) has never experienced it at all, and seriously doubts its possibility. Mairelis ("Uber die durch das Ueberstehen von Infectionskr erworbene Immunitat", Virchow's Archiv. Vol cxxvii pp 468 et seq) after an extensive search of the literature, has collected 106 cases, of which 103 were second attacks, and three doubtful thirds - disregarding altogether many instances of recrudescence. A third attack is of exceeding great rarity. The writer has never met with one, nor have any of his professional acquaintances, and he has been able to find mention of two in the literature - one reported by Strong (Ein fall von Masernrediviv" Deut. med. Woch. 1892 p 1084) the other by Hennig ("Exanthematica" Jahr. fur. kinderh. vol viii, pp 417, 418) The account of the former is somewhat incomplete; of the latter most succinct, being that of a woman attended by Hennig himself during two attacks - once in her thirtysecond year, the other in her thirtythird: the first attack being about the thirteenth year.

Classification of Second Attacks.

Cases of a second attack of measles may be divided into such as appear a long time after the first attack - at least six to twelve months, or usually much later, even from twelve to eighteen years afterwards - and into such as occur as early even as a few days after the first attack, or, at most, from three to four weeks afterwards. Cases of the first sort are reported by Battersey, Roberdiere, Flemming, Haartman, Haen, Brunslow, Mauthner, Traganowsky, Baillie, Ganster, Behier, Spiess, Rayer Kassowitz, Webster, Stebel, Luithlen, Kierulf, Home, Lewin, Karg, Tresling, and others in which, presuming correctness in diagnosis, there could be no doubt of the second infection, and Bierbaum relates an instance of measles three times before the thirtieth year; On the other hand, a subsequent infect--ion in cases of the second division, is less certain; they should rather be regarded as mere relapses. Loschner, Spiess, Metenheimer, Ganster, Vezin, Wilson, Koch, Barbillier, Graves, Eiselt, Schuz, Kostlin, Chinnock, Riecke, Bruckmann, Bottiger, Behr, Schultze, Abelin, Faye, Bidenkap, Nicolai Kierulf, Ruttel, and Thaulow, in which, after apparently perfect recovery, from measles, the disease began again and once more ran through all its stages. According to Duben

and Malmsten, the interval can amount to only a few days. Spiess, on the other hand, reports an interval of from one to two months; so also Stiebel, Bressler and other,. Lippe, who, in the course of three epidemics, has seen fifteen cases of this sort, remarks that the children concerned were newly attacked, three or four weeks after the first disease by coming into close contact with a child lying ill with its first attack of measles; these second attacks were as a rule, more severe the milder the course of the former had been. The same was observed by Seidl, who three times saw a violent and malignant recurrence from four to six weeks after a first mild attack, and in two of the cases, death followed. If future observations should prove the free interval as in fact of a nearly definite duration, it can then be assumed as in the highest degree probable that a definite relation exists between the original disease and the relapse, and not the casual one of re-infection. Thus Rufz reports cases where, in the first attack, the exanthem did not break out and Catarrhal symptoms only existed, while the eruption was perfect in the second attack, which appeared two or three weeks later. Whenever the rash of measles, in the first attack, is not universal, or is merely rudimentary in development, relapses seem to be more frequent than when there has been an intense eruption.

Cause of Recurrent Measles.

A reason for single cases of true recurrence of measles is difficult to assign; according to Weissner it depends upon a temporary suppression, - so-called metastasis - and a subsequent reappearance of the morbid process. Thus Bruckman observed a boy who, after an ordinary attack of measles, was attacked by a violent suffocative Catarrh, which lasted over four weeks, and only disappeared after a second outbreak of measles, which ran a normal course, . Rosenstein attributes such cases to a swollen gland remaining from the first eruption, producing somewhat later, a fresh outbreak. Trojanowsky believes that subsequent attacks, occurring after the lapse of years, may often be explained by Geographi--cal differences in the contagious primciples causing the attacks.

The recurrent form of measles of Trojanowsky is distinguished from the above by the peculiarity of the pyrexia, which bears a close resemblance to relapsing fever, though not wholly identical with it. It appears in the form of two usually rather violent paroxysms which, as in the case of relapsing fever, rapidly supervene and tolerably quickly disappear again, having an average duration of from six to eight days. The acme of the temperature (105.5°F) or more, is attained on the second and third days of the disease, simultaneously with the highest development of the rash, which closely resembles that of measles, but whether identical with it or not, is uncertain: the writer, from the measles-like Catarrh of the Conjunctiva and the respiratory tract, is inclined to think it is. Without trespassing unduly upon the domain of symptomatology, it may be further added that the distinctive features of such an attack are the violent fever, the premature eruption and its subsequent desquanation, the speedy and appreciable enlargement of the spleen, causing an extremely acute leucaemia: both of these conditions, however, disappear again during the remittance pf the fever. If this peculiar malady - as reported first from Livonia, a district in which relapsing fever appears to be more or less epidemic,-(and in spite of Trojanowsky's opinio n to the contrary) is in reality measles, it surely must be a remarkable combination of this with relapsing fever, which thus defines the time of appearance of the symptoms of measles, and may also possess the power of modifying them.

(Even second attacks must be regarded as curiosities, many of them being in reality either cases of German measles mistaken for Morbilli or other diseases accompanied by a simulating rash.)

Transmission to Foetus.

Although measles is most unusually enconntered

between the ages of 1 and 10, the contagion has been known to have been transmitted to the Foetus in utero from the pregnant woman suffering from the disease. Thus, Thomas (loc. cit. p 49) mentions his finding of the characteristic eruptiom of measles in six children at birth; and Jurgensen ("Masern " Wien. 1895, p 44) Numerous other cases of the appearamce of the eruption two or three days after birth, where the mother had contracted the disease shortly before delivery - the virus in all probability, having been tranmitted via the placenta. The former writer (Thomas) however, mentions how he has seen measles in a mother at the fifth month of pregnancy, the foetus remaining unaffected to birth, and only contracting the disease at its ninth year.

In all some twenty cases of transmission of measles to the foetus have been recorded; and in the majority both mother and child appear to have become infected simultaneously the disease presenting the same stage of development at birth in both - usually as regards the eruption, but also(as in the case reported by Ballantyne -"congenital measles, with notes of a "case" Archives of Pediatrics, April 1893) as early as the preliminary Catarrh, mo eruption being present until later.

Hoff's studies are opposite in this connection, ("Sundheds. Aarsberent." 1876) ; he contends that without exception, everybody born in the year 1846, whose mother, according to her own statement and as affirmed by comparison with the church records, contracted measles during her pregnancy, was attacked by the disease, if exposed to it, at the time of the epidemic of 1875. It appeared to make no difference at what month of her pregnancy the mother had hap--pened to be when she took the measles. While ordinarily therefore, there is not the slightest ground for believing the contagion to be carried to the foetus through the placental circulation, it is interesting to note that one child born during the epidemic broke out with a rash when only eleven days old, - two days sooner than would be expected, - the rash in the mother's case being then at its height. Hoff's statement must, in view of our present knowledge pointing to the possibility of communication of the infection by the pregnant woman to the foetus, be taken with due reserve; it is possible of course, that the child may have contracted measles immediately after birth, but it is far more likely that it was infected by the mother during or shortly before delivery.

Menstruation.

Weisse reports the appearance of menstruation for the first time in a girl of fourteen years, during the des--quamative stage of measles; but as there is no statement of the subsequent regular appearance of the same, the possibility of a simple exanthemtic haemorrhage from the genitals in this case must not be lost sight of.

Measles and other diseases.

(A) Chronic Diseases.

The susceptibility of measles, according to Mayr, appears to be slightly diminished by chronic ailments, as epilepsy, paralysis, and S t Vitus' Dance.

(B) Acute Diseases.

Acute diseases seem to have a certain amount of influence in postponing an outbreak of measles, so that the latter does not appear until convalescence from the former. In support of this, we have Weiss's statement that (1) measles appeared in a boy sixteen years, immediately after facial erysipelas and only on those places where no cutaneous exfoliation had occurred; (2) in a typhoid fever patient of thirteen years, it immediately succeeded and ran a regular course.

Acute diseases have been some times observed to occasion modifying changes in the appearance of measles, or to occasion as it were, a clinical mixture of the coinci--dent maladies. According to Panum, the development of vaccinia is at one time uninfluenced by measles; at another according to Halen, and Cramer, - the same may be conspicuously

protracted; and the same phenomenon in regard to small pox has been described by Fouquier. Whooping Cough is said by Mayr, to disappear entirely when symptoms of measles appear, and only to reappear after their complete expiration. Mumps on the other hand, according to Liverani, attacks by preference patients with measles, and increases in intensity to the disease; and the same has been noticed by Mayr in cases where measles attacked children immediately after Cholera. That measles can appear during the course of Variola, Scarlatina, and Varicella, and vice versa, has been proved by numerous writers but denied by Hebra. Bierbaum encountered measles during the course of a tuberculous meningitis; Guersent, with a malignant pustule. Habisreutinger reports the disease in a boy during the fastigium of erysipelas serpens, which appeared on the right foot, and attacked first the right, then the left half of the body; here it appeared partly where the erysipelas had disappeared and partly upon the unaffected places. Barther and Rilliet saw measles three times with erysipelas of the face, though here the former did not affect the face. Finally, the susceptibility to measles is said to be increased by many diseases, especially by affections of the organs of respiration, an assertion which is hard to prove, since the susceptibility to measles of those previously unaffected is in every case so marked.

Measles in Lower Animals.

From the experiments of Behla (Centralbl. f. Bakt. und. Parasit. xx, 16 & 17) it appears tolerably certain that measles may attack some of the lower animals. Behla succeeded in inoculating a sucking pig from the oral and nasal secretions of a case of measles, so that there appeared in the animal - four days afterwards - catarrhal symptoms in the nose and eyes, similar to those of the ordinary attack in the human being. The animal appeared to be definitely suffering on the fifth day with symptoms of shivering and anorexia, the temperature at this time being 103 degs F. On the eighth day reddish spots were observed (on the face, ears, neck, and other parts of the animal's body devoid of hair) extending in a day or so over the entire integument. The rash (which in no way differed from that peculiar to human measles) was followed, in due course, by desquamation. Fourteen days later another pig, which had been allowed to associate with this one, was observed to be suffering from measles also, and to desquamate similarly, after a four day's illness. Again, seven days after this, a third (associate) pig exhibited the same phenomenon. The disease was at the time regarded as being swine fever, although the usual bacteriologic search after the specific bacillus of that disease proved futile. Behla's experiments were repeated by Josias (La med. Mod. No. 20, 1898) with negative results. others report confirmatory evidence of Behla's findings, and Chavigny (Bull, Med. Paris 1898, 12 p 334) has reported the disease in an ape. For all we know to the contrary, and in view of the specific nature of morbilli not being established, the eruptions mentioned by these writers may not have been those of measles at all.

B A C T E R I O L O G Y

The nature of the poison is at present unknown, although it has for long been under investigation. So long ago as 1878 Braidwood exhibited before the London Pathological Society, what he believed to be the pathognomonic bacillus of measles.

Canon and Pielicke (Berlin Clin. Woch. 1892, p 377) in 1892, claimed to have discovered a specific bacillus in the blood of all the fourteen cases they examined. The bacterium was observed to be very variable in size (very minute to 3.4 m) Sometimes as small as a diplococcus, or again, in length equalling the diameter of a red blood corpuscle. The Bacillus required for its recognition a special staining process; the blood being carefully, thinly and evenly spread on sterile cover-glasses; fixed by ten minutes immersion in

absolute alchohol, and then stained in a solution consisting of concentrated aqueous solution of methylene blue ....40 - 0.25% eosin solution (in 70% alchohol) .....20 Distilled water 40.....40 After which for three hours at incubator temperature. The bacillus stains interruptedly with this mixture; and the fact that it is only to he found in preparations taken from cases of measles from the sixth day of the disease onwards upsets its one-time etiologic interpretation. The discoverer succeeded in cultivating the organism on bouillon, but on no other medium, nor did it respond to Gram's method of staining. It is said to be possessed of motile properties, but incapable of spore formation. Its presence has been demonstrated not only in the blood but also in the ocular and nasal secretions of measles and has been held by some to persist during the entire attack, as well as for a variable period after its subsidence. On the other hand, however, Josias (La Med. Mod. June 2,1892) examined the blood and secretions according to the directions of these observers but with negative results

Czajkowski (Centralbl. f. Bakter. 1895, Bd. xviii, Nos17 and 18, p 517) reports ~~that~~ the finding of similar supposed specific organisms in the nasal and ocular secretions and the blood; and the obtaining of cultures (in 19 out of 56 cases, upon glycerine - agar, but especially upon blood-glycerin - agar) the growth being delicate, scanty, and of a dewdrop appearance. Under the microscope the colonies are observed to be devoid of definite structure. Inoculation of the bacilli into mice proves fatal; and they are motile and unstainable by Gram's method. The specificity of Czajakowski's organism appears to be quite as questionable as the foregoing, and the two are probably identical, for they are both found in similar regions, are motile, and produce septicaemia in rabbits.

Doehle (Vorlaufige Mittheilung uber Blutbef. bei. Masern, Centralbl. f. alleg. Pathologie und Pathologische Anat. Vol iii, No 4, p 150) in 1892 found peculiar protozoan parasitic organisms (motile, flagellated, measuring from ½-1 m. in diameter, with a dark centre and light margin) in the blood plasma and red corpuscles of eight cases of measles investigated: the other forms discovered being probably the same in various stages of development.

Behla (whose experiments have already been described) claims to have discovered the same organism in pig suffering from measles - like symptoms.

Barbier (Soc. Med. d. Hop., 1897, Feb 20) however, after numerous attempts failed to discover the organism in the blood, although he was able to isolate an anomalous bact--erium from the ocular secretion in nearly every instance, and from the oral and nasal in many. This particular organism appeared to be a somewhat constant finding in measles and it is therefore regarded by some (notably by Robet - These. de Paris, 1896) as actually specific. Durck (Deut. Arch. f. kalin. med. 1897, Bd LVIII) attached considerable etiologic significance to his finding of a streptococcus in measles cases, more especially those suffering from pneumonia, and Hutinel (Rev. meus. d. mal. d. l'enfance, 1897) also interprets its presence similarly from his observing the great readiness with which this form of streptococcus pneumonia spreads from measles patients to others in the same hospital ward.

Arsamaskpff (Bolnitschnaja Geseta Botkina 1898, and Centralbl. f. Bakter, 1899, xxv 831) reports this dis--covery of a small bacillus (in length only half the diameter of a red blood-corpuscle and three-fourths as wide as Eberttis typhoid organism) in the general circulation, the pharyngeal and ocular secretions as well as in the pneumonic areas of measles patients, the same responding to cultivation in six instances, especially in milk wherein the bacilli were seen to preserve their vitality for three weeks. Attempts at inoculating animals, however, gave negative results.

Perhaps the most recent and important researches as to the bacterium of measles are those made by Lesage (Bull. de la soc Med. des Hop. de Paris, Mar 15 - 22, 1900) in 200 specially selected cases of measles from the nasal secre--tions or blood of many of which several rabbits were inocu--lated and with positive results in nearly every instance; and from the constancy of this Lesage believes himself justi--fied in regarding the delicate micrococcus so found as pathognomonic, and that so far as it is possible to recognise measles in a furry animal, his inoculations induced the disease. Lesage's micrococcus is best cultivated on glass gelose, (the cultures resembling those of the pneumococcus) is declourized by Gram's method, and stains but slowly. Lesage found it absent in 25 test cases of scarlatina, but present in six cases complicated with measles, as well as in two cases of the latter complicating diphtheria; it was absent in 45 healthy children, and present only twice in fifty three children who had previously suffered from the disease.

Summary of Conclusions.

From what has been noted it would appear that the bacteriology of measles is still somewhat obscure and that future study of the blood may either confirm some of the observations mentioned, or reveal something of as yet unknown etiologic significance.

SPREAD AND INFECTIVITY

The circumstances under which measles was rendered epidemic at the Faroe Islands has already been described, and still, and ever will, constitutes a classic illustration, and many equally valuable instances of its virulence and infecti--vity are on record, actual contact with a source of infection having been proved in all, except perhaps in the somewhat doubtful case reported by Tufnel (Dublin Jour, Med. Sci. July 1872) - that of a young soldier, who developed measles after 45 days of solitary confinement, and total isolation from his fellow creatures: during which period it was known to have been absolutely impossible for the contagion to have been conveyed to him.

Inoculability.

The inoculation of measles by means of the blood was first attempted by Home of Edinburgh, at the instigation of Munro, in the year 1758, He laid for three days, upon fresh cuts in the arm of a healthy subject, linen rags soaked in blood taken from incisions through the measles spots upon the last day of their presence, with the result that mild symptoms were induced entirely different from the disease then prevalent: the rags referred to were observed to lose their infectivity after ten days. ("Abhandlung uber. dis Masern" Gottingen).

Willan and Themmen - at Thuessink's suggestion, conducted a similar experiment - negative in result, whilst Wachsel was successful; as were others afterwards, using the tears, saliva, blood, mucus, and the debris of the cutaneous desquamation, and epidermis. Albers - sceptical of Home's experiments being conducted in a hospital filled with measles patients, was able to obtain a successful inoculation; and Speranza, (Jour. der praktischen Heilk. vol. iv, p 124) in 1822, confirmed the findings of Home (by being himself successfully inoculated) as also Bufalini (in Italy in 1854) Locatelli, Rossi, Figueri, Percival, and Horst, The experiments of Katona ("Nachricht von ener in grossen erfol--greich vergenommenen Imptung der Masern Wahrend einer epidem. Verbreit. derselben", Oesterr. Med. Woch. 1842, No 29, pp 697 698.) in 1842, are noteworthy. In all, as many as 1,122 inoculations were made, the vast majority of which induced only a mild disease, and this at a time when every case of the epidemic then raging happened to be of uncommon severity: no inoculated person died, and only 7% of the inoculations

failed to take. The inoculations were made after the style of ordinary vaccination and with a mixture of blood and the contents of the miliary vesicles, or with tears only. At the point of inoculation, a very evanescent red areola appeared and the prodromal pyrexia and other symptoms appearing on the seventh day, were followed by the measly eruption on the ninth i.e, ten days after the inoculation, the course of the disease thereafter being extremely mild, and the fever disappeared on the fourteenth day, so that the patient was quite recovered by the seventeenth day. In 1848 and 1852, Mayr (Loc. cit, p 12) made similarly successful experiments, whereas Wendt, Jorg. and others, report failure, so that the entire question of inoculability may even in our day be regarded as undecided.

The same author's experiments with the nasal secre-tion, proving that the contagion of measles can be spread by it, are of considerable practical interest. At the close of an epidemic he placed fresh nasal mucus upon the mucous lining of the nares of two children, the first symptoms of measles developing in both, at the eighth and ninth day respectively, and the characteristic eruption upon the thirteenth after inoculation.

His attempts, however, to spread the disease by means of epidermic scales from desquamating children met with signal failure; and Cullen and Girtanner state that children have even been know to eat the scales of measles without contracting the disease. Hugh Thomson (Glasg. Med. Jour. Vol xxxiii pp 33 et seq, June 1890) was unsuccessful in his experiments consisting in the inoculation of serum from blisters made close to measly eruption.

CONTAGIOSITY

(A) Before the appearance of the eruption. - There seems to be no shadow of a doubt but that measles is highly contagious even before the characteristic eruption makes its appearance upon the skin, that its contagious property can be dated from the onset of the catarrhal symptoms lasting through the eruptive stage and ceasing before the termination of the desquamation; that a susceptible person ~~person~~ will contract the disease the very first time that he comes in contact with it; and that the duration of the febrile attack is the same in all cases. As bearing up this, are the cases reported by (a) Panum (Virchow's Archiv. vol T, p 499) of a young male who on May 26th had slept in the same bed as a sufferer from measles in the pre-eruptive stage, the eruption develop-ing on the 9th June; (b) that described by Paterson during the Faroe epidemic of 1875, of a teacher who conducted his class right up to the moment of the eruption, and so infected the entire school; and (c) Kerschensteiner ("Das Incubations der Masern", u.s.w. Bayerisches arzlich. Intellig., 1857 No 9, pp 103 et seq) who during the Munich epidemic of 1855 found in nearly every instance from ten to twelve days to intervene between the appearance of the eruption in the infecting and the infected child, the average being according to Pfeilsticker (Loc. cit. p 39) - whose work in this connection proves both instructive and interesting reading - ten days .

It is perhaps during the prodromal stage that the greatest spread of contagion takes place, as is evidenced by the slightly varying duration of the incubative stage in the cases referred to above, where the contact of the infected with the infecting was but for a moment or for a day. Reckoning, in the common cases where a family is infected, fourteen days back from the outbreak of the exanthem in the second child attacked, one comes noticeably often upon the first or second day of the prodromal stage, or the last day

of the incubative stage in the original case.

(A) During the Eruptive Stage.

From what has already been said concerning the epidemics at the Faroe Islands, the certainty of the infect--ivity of the eruptive stage of measles is apparent; so much so that the Physicians in charge of the districts there disregarded the other stages entirely as to possible contag--iosity.

Some authors again, holds - Hoff especially, - that the desquamative stage alone is infectious; whilst others - as Panum and Peterson - deny it, stating, with a mass of substantiative evidence, that the contagion is communicated during the prodromal period.

(C) During the Stage of Desquamation

Owing to the diversity of opinion expressed, the contagiosity of this stage is somewhat difficult to prove. The fact of new cases being observed (prior to the duration of the incubative period being known) develop about the time that the earlier ones were peeling, led to the belief that measles was in reality communicated during desquamation. This one-time popular view has now entirely given way to the present somewhat exaggerated one that it is quite impossible for infection to take place so late in the disease: owing to lack of reliable evidence to the contrary, this is the best theory tenable, and one that inoculatory experiments and clinical observation have utterly failed to disprove. In the latter connection indeed, supposing a patient to have been infected from the desquamations of another, how can it be ascertained for certainty that the contagium vivium was really existant at the time in the epidemic debris, and that the poison of an earlier stage were not still in the infected? If the disease be communicated at all during this stage, the writer believes that it must be very unusual, the more so as susceptible individuals seldom or never lack the opportun--ity for contact with measles patients during a stage of established infectivity prior to that of desquamation.

Propagation of measles by non-infected persons.

This can be better explained by relating the two cases recorded by Panum (loc cit) (1) Measles broke out in a house which was known to have had no intercourse with the outside world except that a (healthy) physician had spent the night there a fortnight before, he having come from an infected district four miles away; and being compelled, moreover, to travel in an open boat, in stormy rainy weather (it was however alleged that some of the boat's crew who brought the physician over were at the time suffering from measles); in the same way the (2) the disease had, it was said, been introduced into uninfected houses by a midwife (just recovered from the measles at Copenhagen); Hoff, however, denied that the midwife had ever been in Copenhagen, and asserted that he had it on creditable authority, that she had suffered from the disease in Midtvaag. It appears absolutely certain, moreover, that - judging from the official reports of the Faroe Islands - in not a single instance was the contagion thus conveyed (Jahresb. des Sundhedscollegium f. Danemark).

The question was fully discussed before the Munich Medical Society by Kerschensteiner and others (Ueber die Vertragb. der Masern, des Scharlachs und der Blaltern durch dritte Personen", Aerztl. Intellig. Munch. Med. Woch. 1882 p 413; and "Die Verbrect. von Masern, Scharlach und Blattern" Vortr. uber Gesund. u . Rettungswesen Wahrend der Hygiene Ausstellung za Berlin" 1883) whg, by a large majority, gave their opinion in the negative; so that it may be taken as fairly well established that if infection be ever carried by third parties, the same must be of exceeding great rarity, as additional proof of which witness the fact of Doctor's children being attacked by measles no oftener than others.

Conveyance of Infection by Fomites.

That measles has been conveyed in this way, we cannot doubt, but it is just as rare a happening as the foregoing. Amongst the recorded instances the following

are noteworthy:- (1) A student visiting Jena fought a duel and was forthwith punished by solitary confinement in the College "Carcer": on the second day of his isolation he received a letter from a measles patient, with the result that he came to suffer the disease nine days afterwards. (2) A tailor of Dresden was engaged upon a boy's suit of clothes, in the same room as his children were suffering from measles, and on completion of his work, carried the garments to the boy's house to be tried on, with the result that the child showed signs of measles a few days afterwards: the fact, however, of measles being epidemic at the time considerably detracts from the eliologic significance of this experience, (Forster - Einige Bemerkungen uber die Verbreet der Masern und des Scharlachs "Jahrl f. Kinderh." n.s. vol x, 1876, p 16) (3) Thuessink vouches for the fact that he knew of a case where the infection was conveyed by a letter, and (4) of one where it was attributed to an engraving sent by post.

To disprove the theory of propagation of measles by articles of common use, the following case may be adduced:- At the time of an epidemic on the Island of Samsoe (Vide report by M. Flindt) in a certain school the children in the upper standards were not taken ill until over a month later than those of the lower class, and this in spite of the fact that the former sat in the same room as the latter, amongst whom the disease raged, and who attended school in the morning the older scholars in the afternoon only, the disease, more-over passed over these until it happended to be introduced by a member who contracted it at home.

VITAL RESISTANCE OF THE POISON.

How long the contagion in clothes and other objects remains active is not known; its tenacity , however, should it really exist, must be but small and of short duration. Some indeed assert that, no poison being left in the sick room after the patient's recovery, anyone may inhabit it with impunity, as is borne out by experience. This experience, however, in no way disproves the presence of the poison, for the members of a family referred to in such cases have most likely already suffered from the disease and are thereby rendered immune. Evidence is so far obviously too scanty and difficult to obtain to allow of an emphatic conclusion either way with regard to the theory in question.

The Air-borne theory of measles.

The ennunciation of this wellknown theory seems to have been due to the everyday experienced practical impossi-bility of protecting the uninfected juveniles of a family, or even those of other families in the same block of build-ings, by isolation of the child affected with the disease: the possibility of the infection of the former during the catarrhal stage of the latter appears to have been entirely overlooked.

For want of evidence to disprove this theory, (especially in cases where contact of the infecting with the infected has not taken place, the latter perhaps merely entering the sick room of the former) one is forced sometimes to place a certain amount of reliance upon it: how often it occurs is a question difficult to answer.

The probability of the contagion of measles being incapable of being carried to any great distance through the air has been demonstrated by Effersoe (Sundhedskollegiets Aarsberet ning 1883) who relates the case of (1) a boy who for several hours occupied a room next to one in which a meas-les patient was confined at the height of the eruption, and who in spite of the door between the two apartments being open all the time, did not contract the disease until infected elsewhere many weeks afterwards: and (2) of two families three children of one of them suffering from measles, who shared a flat of two rooms, the apartments being separated only by a thin partition of lath and plaster, allowing of the free passage of air from one room to the other, the disease failing to be conveyed thereby: the infection was afterwards

observed to reach them by another channel when all suffered.

Vehicles of Contagion.

In most cases contagion is due to association with those infected and there is no gainsaying the fact that a slight exposure is usually sufficient to superinduce the disease; sometimes a prolonged one is needed, but here both the susceptibility of the infected, and the total amount of contagion existing should be remembered. Thus, under circumstances where rooms are badly ventilated or crowded with patients the poison must obviously be present in greater amounts than under opposite circumstances, and a slight contact may accordingly be presumed to communicate it to one susceptible to its influence; the prompt response to the adjustment of the ventilating apparatus in such cases proves the reasonableness of this opinion.

Next perhaps to the association of families, the most frequent opportunity for infection occurs in the schools to which the poison is conveyed by children in the catarrhal stage of the disease and conveyed to any child there suscept--ible to its influence, and so from the schools into the entire home circle.

Of this common observation two instances may be quoted by way of illustration (1) Flindt (Sundhedskollegiets Aarsterent ning 1879) reports that the island of Samsoe had been quite free from measles from 1864 to 1878 when an epidemic was started by the advent of an infected child to the island in question, to be generalised by the school children there. (2) Furbringer (Eulenburgs "Real-Encyklo--padie" 2nd Edin. Art. Masern) recounts how during Jena epidemic of 1879 - 80 the schools of two neighbouring hamlets remained free from measles for two months until a case occur--ring in each of them spread the disease throughout the respective villages, the curious feature being that during the period of exemption doctors and relatives of patients visited the homes of the villagers and the children played with one another as freely as ever.

Duration of Epidemics.

The obvious inference from what has already been said is that an epidemic would prevail as long as there are any persons remaining in a district susceptible to the poison; and that, naturally, the larger a district the longer the duration of the disease therein. It must likewise be remembered that considerable variety is at times noticeable in the degree of virulence of the contagion according to which the disease spreads with a corresponding rapidity or the reverse, accounting for the sudden outbreak of an epidemic in very large communities where the disease, of course, is practically endemic and "susceptibles" numerous: the same explanation applies perhaps with almost equal appositeness as a rule to villages and other places where the population changes but little.

Outbreak of measles in the Sporadic Form.

An appearance of measles in the sporadic form is common enough in large cities, where the disease, as has been noted above, is to a greater or lesser extent endemic. Here to, it exhibits at times a tendency to light up into an epidemic. So also, the disease is frequently observed to become epidemic in small districts (remote from main roads and large communities) at intervals - sometimes of many years- varying with their isolation during which not a single case of measles may have been reported. Hence also, single epidemics are there comparatively more considerable in small places than in larger ones, and where, to a certain extent, several epidemics must be divided amongst those of the population who are predisposed to it. The larger a place becomes in the lapse of time, and the more considerable the commerce in it and with it, the more frequently epidemics of measles occur, and the more numerous become the intermediate sporadic cases, so that eventually in very large places, the disease is always present. This state of affairs can be explained by the great contagiousness of the disease, and by

the universal susceptibility of individuals not as yet attacked. The number of these increases after a time by births to such an extent that it evidently often requires merely the introductiin of the contagion by a single person to infect quite rapidly the larger number of those belonging to the new generation, after which, from lack of material susceptible to the infection, the epidemic fades out, to appear again after years under similar conditions. In large places with much commerce the number of those susceptible can never be very considerable, since it is continually diminished by the constant introduction of the contagion from all directions, and by the more or less sporadic prevalence of the diseases thus produced.

Periodicity of Epidemics.

In addition to what has been said in a former section it may be specially noted at this juncture that it was for the reasons just mentioned that measles was reported as occurring with an approach to ~~the~~ periodicity amongst largish communities, so that in many of them the outbreak of such epidemic was able to be foretold with more or less certainty, the intervals were observed to vary from two to four years, and that usually the shorter the intervals, the milder would be the ensuing epidemic , and vice versa. It was noted furthermore, that a mild epidemic was, as a rule, soon followed, and likewise out of its regular turn, by a more severe one, compensating for the omissions of the former. Reports, indeed, are extant, from various places in regard to the succession of these epidemics, during long periods, and from these it appears that in certain years the disease is universally prevalent, so that epidemics of measles will be found prevailing simultaneously in different cities, while however, on the other hand, exceptions and irregularities are frequent. Sometimes the epidemics are not coincident in neighbouring localities connected by constant intercourse, a proof that in this question local conditions play an important part, and are frequently of determined influence. Thus it a ppears that no universally applicable law with regard to the periodicity of epidemics of measles can be established, and the most that can be asserted is, that with the increase of intercourse and the growth of large cities, they have beeome in these especially, by degrees, somewhat more frequent. The following examples of epidemics from various authors whose names are indicated in parenthesis (references will be found in the bibliography) are quoted by way of illustration:- (1) The population of Meerane was in 1837 - 4,634; in 1843 - 5,550; in 1850 - 7,337; in 1856 - 9,530; in 1861 - 12,747; in 1867 - 16,511. Epidemics occurred in 1837, 1850, 1853, 1857, 1861, 1865, 1867, 1869, becoming thereby correspondingly more frequent with the increase of the population (Geissler).

(2) In Dresden in 1835,-1838, 1840, 1844, 1846, 1848, 1852 (1853), 1856, (1858), 1860, 1864 (1865), and 1867 (Forster).

(3) In Dantzig during the years 1863 - 1869; 1863 - 64; 1865, and 1868. (Lievin).

(4) In Konigsberg in 1857 (1860 - 61), 1869 - 63, and 1868. (Schiefferdecker).

(5) The population of Halle was, in 1872 - 24,149; in 1852 - 36,076; in 1871 - 52,400. Epidemics there occurred in 1784-85; 1790; 1795; 1801; 1804; 1806; 1808; 1810; 1812; 1815; 1818; 1819; 1823; 1828; 1831; 1833; 1836; 1838; 1839; 1841; 1842; 1843; 1845; 1848; 1850; 1852 - 53; 1855; 1857; 1860; 1861; 1864; 1867; 1869; 1871 & 1872 (Barensprung and Weineck).

(6) In Zurich epidemics were observed in 1827; 1833; 1837; 1843; and 1849 (Mayer-Hoffmeister).

(7) In Erlangen in 1819-20; 1825; 1831; 1832; 1839; 1847; 1852-53; and 1856 (Kuttlinger)

(8) In Stuttgart - in 1849 - 50; 1852 - 53; 1855 - 56; 1858; 1861; 1864 - 65 (Kostlin).

(9) In Wurzburg - in 1846; 1849; 1854; (1855); 1860; 1863; 1866; 1868; 1871; (Voit).

(10) [illegible]

(10) At Frankfurt-on-the-Main. in 1842; 1846; 1847; 1850; 1854; 1855; 1858; 1860; 1861; 1863 - 64; 1866 - 67; (Kellner and Spiess).
(11) In Munich - in 1859 - 60; 1861 - 62; 1864; and 1866 (Ranke).
(12) In Vienna - in 1842; 1845 - 46; 1848; 1850 - 51; 1853; 1855; 1857; 1859; 1862; 1864; 1867; and 1869 (Mayr and Fleischmann).
(13) In Prague - 1843 - 44; 1847 - 48; 1850 (1851) 1853; 1855 - 56; 1857 - 58; and 1859 - 61 a large number of sporadic cases. (Loschner).
(14) In Berlin - in 1843 - 44; 1844 - 46; 1848; 1851; 1853; - 1855; 1857; 1859; - 66; (Romberg and Egel); 1862 - 63; 1864 - 65; 1866 - 67 (Passow) 1786; 1879 - p0; and 1793 (Formey).
(15) In Geneva - in 1832; 1838; 1842; and 1846 - 47; (Rilliet).
(16) Hagelliock - 14 years interval.
(17) Faroe Islands - 65 years "
(18) Cape of Good Hope 30 years "
(19) In Iceland - in 1644; 1694; and 1846.
(20) In Madeira - first epidemic in 1808.

P A T H O L O G Y

ANATOMIC CHANGES

THE SKIN.

The eruption of measles first becomes noticeable about the hair sacs and their apertures, which become raised above the surrounding skin so as to form minute papules; at these points vesicles sometimes appear, resulting from the closure of the apertures of the oil-glands; sometimes the papules may be found close together. With these changes occurs a marked superficial congestion of the neighbouring integument, so defined at the margin, as to be distinguishable from varicella, this being due, according to Mahr, (Art. "Measles" in Hebra's"Diseases of the Skin" New Syden. Soc. 1866, vol 1, p 177) to the cutaneous furrows limiting the capillary suffusion; the large size of some of the macules is due to the coalescense of smaller ones. Simon ("Die Haut--krank durch anatom. Unters. erlautert" Berlin, 1851, p 122) and Unna ("Die Histopathol der Hautkrank p 625) both give a detailed account - the best perhaps extant - of the histolo--gic changes induced leading to the formation of the ordinary flat or slightly papular measles-spot. The symptoms of the disease when carefully considered, point to a spastic paralysis of the blood vessels of the skin, following close upon the primary active hyperaemia which develops in the neighbourhood of the infectious organism after it lodges in the capillaries of the skin. This spastic condition of the vessels according to Unna, explains the Cyanotic appearance the papular form, and the urticaria-like oedema of the centre of the eruptive spots, also the frequent escape of haemoglobin. It is not to be wondered at therefore, that on cutting across a measle spot, either on the living or the dead subject, one fails to detect any evidences of hyperaemia or to discover any dilated blood-vessels: other signs of the oedematous stage, however, are present. The rapidly forming spastic oedema always collects at the points of least resistance, which, in the early years of childhood, when the disease usually occurs, are represented by the adipose tissue, the sweat glands, and the sheaths of the larger blood-vessels supplying the muscles of the skin and the hair follicles. Accordingly, in specimens hardened in Alcohol one finds the ducts of the sweat glands highly oedematous, looking like great gaps in the tissue, partly filled with distended areolar tissue and thin-walled connective tissue cysts, while the corresponding sweat glands compressed by the oedema lie in an angle at the end of the ducts. Individual sweat glands hair follicles, and muscle-fibres, all seem to be floating

free in broad cleft-like lymph spaces. In addition, the middle and deeper layers of the skin contain spaces and chan--nels round, oval, or irregularly shaped, which can only be regarded as in part distended lymphatics, in part as enormous--ly dilated lymph spaces. In a few places, more especially in the neighbourhood of the hair follicles, these dilated lymph channels can be traced upward to the papillae of the corium. These signs of an intense oedema of both skin and subcutaneous tissue are equalled in importance by the almost complete absence of a cellular exudate. The emigration of white blood-corpuscles does not exceed that to be observed in any simple passive hyperaemia; it is, indeed, rather less than is usual in such cases, for which reason, only a few leucocytes are noticeable in the epidermis. The rete mucosum does not appear thickened: the oedema does not extend to the lymph channels of this layer; and no signs of mitosis are to be found at the hight of the inflammatory process - this is rather an accompaniment of desquamation. Some slight anomalies of cornification are present, however; the stratum granulosum is missing in places, while the basal lamellae of the stratum corneum are thickened. At the time of desquamation, the superbasal corneus lamellae become separated from the basal, and, together with the middle and outer lamellae, fall off in the shape of measles scales: this loss of epithelium is replaced by mitotic cell prolifer--ation.

Still greater changes occur however, in cases where the eruption takes the form of small nodules, consisting of well-developed inflammatory lesions of the blood-vessels, and marked degenerative changes in the epithelium; so that the theory of earlier days - unsubstantiated by microscopical examination and based on microscopic evidence only - that the eruption consisted of an inflammation of the follicles of the skin, with a slight degree of exudation, must be discarded.

Unna (Univ. Med. Jour. Oct 1895) furthermore claims, in the eruption of a patient recovering from measles, to have noticed a marked resemblance to the pock of variola; no alteration of the epidermis was to be found, and he supposed the eruption in question to have originated from the irrita--tion occasioned by the presence of bacilli in the vascular loops of the papillary layer of the derma. In addition to this, Unna has observed a peculiar non-haemorrhagic thrombosis of the superficial cutaneous capillaries, from the same cause as the aforementioned; and that at autopsies, on such cases in which gangrene has occurred, the constant presence of pyogenic micro-organisms.

Catrin ("Les alterations de la peau dans la rougeole" - Arch. de Med. Exper., 1891, No 2) states that he has encountered a marked diapedesis of the papillary leucocy--tes; and also a colloid degeneration of the deeper layers of the epidermis, appearing first of all in the perinuclear zone.

Neumann (Histolog Verhaud. der Haut. bei Masern u. Scharlach. - Med Jahrb. 1882 p 159) reports a remarkable form of round cell proliferation, especially about the blood-vessels, follicles and coil glands.

THE MUCOUS MEMBRANES.

The mucous membranes - usually of the conjunctiva, nose, pharynx, larynx, and the bronchial tubes - in measles are the first structures to show anatomic alteration, the latter being that of an ordinary catarrhal inflammation; the secretions resulting from which are at first transparent, later opaque, but alkaline throughout (Mayr - loc cit).

What first attracts attention is the light-bluish colour, or "skimmed milk appearance" induced by the dilation of the capillaries; followed in 24 to 48 hours by the dark red papules, these bearing a close resemblance to those subsequently developed in the skin, with the exception that on the mucous membranes they are less sharply defined, from the gradual blending of the congested vessels with the neighbouring capillaries. According to Slawyk (Deut. Med. Woch. Apl 28, 1898) the whitish dots or vesiculae-like

elevations are induced by the thickening, and sometimes subsequent fatty degeneration , of the epithelial cells; careful investigation has failed to reveal the presence of any special bacteria in the parts so affected. At times, however, the intensity of the inflammatory process may, (commencing with the lymphatic follicles) induce greater tissue destruction so that ulcers of considerable depth are formed. Corresponding in the main to these are the anatom--ical changes to be found in the mucous lining of the intestines - involving Peyer's plaques and the solitary glands - the mouth, larynx & trachea (Gerhardt - "Lehrbuch der Kinderk. Tubingen, 1871, p 94); whilst Steiner, Thomas and Bohn ("Masern" Wien, 1895, p 80) claim for the dark reddish spots on the intestinal mucosa a marked resemblance to the cutaneous eruption. Jurgen--sen (loc cit.) directs attention to similar findings in the mucous membrane of the genito-urinary tract.

THE BLOOD.

The blood presents no pathognomonic alterations in measles cases, although it has at the necropsies of severe cases been sometimes observed to be of a bluish or brownish-red colour; in very exceptional instances only, to be deficient in coagulability; and in others either of a tarry thick consistence, or thin and of a cherry-red tint. In the eighteen cases of measles specially investigated by Widow--itz ("Jahrb. f. kinderh." B 28, S 25) the haemoglobin gradually diminished as the fever subsided, which is a remarkable finding, as it nearly always is found to be increas--ed during convalescence, until quite equal in amount to that found during the acme of the illness.

Franz (Wi. me. Woch. 1899, No 47) - who used Gowers haemoglobinometer in his studies - contends from numerous observations that the haemoglobin is never greatly diminished and that it is sometimes in fact increased, that the cells show no decrease - rather an increase - when counted during the eruptive period of the disease; that any alteration in the erythrocytes (as regards form, the formation of rouleaux etc.) cannot be determined - in only one case (during the hight of the regeneration of the leucocytes) were two normoblasts found in a single preparation; that no marked quantitative change in the blood-plaques or in the fibrin formation occurs; and that in measles a relative, and to a certain degree, an absolute, increase of the large mononu--clear cells and transitional forms takes place which can always be appreciated when proper procedure is adopted.

It is usually at the beginning of the disease and in days when the mononuclear elements are present in greatest abundance, that the polynuclear neutrophiles most often are to be found in normal numbers; but the lymphocytes show a slight decrease from the normal percentage, not only relatively, but absolutely. This, however, does not occur equally in all cases, gradual variations - according to the time of obseration - being noticeable.

Great variation at the time of regeneration of the blood is to be noticed in the form of the single lymphocyte, and many, moreover, which are essentially transitional stages between it and the mononuclear giant-cells. The eosinophile cells seem, however, to bear no constant relationship to the other percentages during an attack of measles; but in some cases, at the acme of the disease, they are present in dimin--ished numbers, and during the regenerative process, of the blood, they seem indeed to be comparatively increased in number; in some cases only.

Reviewing our present knowledge of the condition of the blood in measles, Ewing ("Clinical Pathology of the Blood" 1901) remarks that (1) the red cells have been found in the great majority of cases to suffer little or no change, but a loss of Hb is usually demonstrable after defervescence. (2) In adults, uncomplicated measles never causes leucocytosis, but is characterized rather by hypoleucocytosis, reaching in certain cases 2,700 cells. From 4,000 to 6,000 cells are commonly seen (Pee, Pick, Rieder, Rille, and Felsenthal).

(3) Normal or slightly reduced numbers of white cells are found at the onset of the disease. At the height of the exanthem they are usually at their lowest figure (Pee, Turk), and return to the normal within a few days or a week after defervescence. When the bronchitis is severe, there may be a moderate leucocytosis, Hayem finding 10,000 to 14,000 cells occurring in such cases in children. Rieder observed slight leucocytosis in a case complicated by catarrhal pneumonia, Cabot observed 9,000 cells in two cases, one haemorrhagic. In three cases occurring in malarious subjects, no leucocytosis was found; the malarial parasites reappeared with the chills during convalescence.

(4) The proportions of the various leucocytes show no distinctly abnormal variation. Turk found a rather high percentage of polynuclear cells, during the fever, with diminution of small lymphocytes, Pee, Klein, and Turk noted an excess of large mononuclear cells. The eosins are usually in low normal proportions during the early febrile period, but tend to diminish as the eruption declines; yet Turk found nearly 5 per cent during the second week of the disease.

(5) Bacteriologic examination of the blood was negative in ten cases examined by Barbier. Wieber claims to have found in the blood of measles a protozoon which he has also seen in small-pox.

(6) Regarding diagnostic procedure, typical cases of measles and scarlatina can, therefore, sometimes be distinguished from each other in their early stages by examination of the blood, yet, as Turk says, the blood in measles strongly resembles that of a mild scarlet fever, as both show a nearly normal number of leucocytes and normal proportions of eosins. Yet equally severe constitutional disturbance should give on the second or third day leucocyto-sis of scarlatinal, normal or diminished lencocytes if for measles.

From the foregoing it may be concluded that the most characteristic changes in the blood in measles are the almost constant relative and absolute increase of the large mononu-clear cells and transitional forms present at the height of the disease and during convalescence, while during this period the polynuclear neutrophiles and lymphocytes are dimin-ished in number. For other points dealing with the examination of the blood, the reader is referred to the chapter on bacteriology.

THE URINE.

In nearly every severe case of measles, Ehrlich's diazo-reaction is present, and is first noticed on the third day of the disease (Franz - Wi. me. woch. 1889, No 46) In milder cases it may be either absent altogether, tardily developed and with difficulty, or be extremely evanescent. Its significance, however in measles is, slight, although, to confirm a doubtful diagnosis, it may at times be worth remembering.

THE LYMPHATIC GLANDS.

As a rule these are less inflamed than in either scarlatina or rubella; and, generally speaking, their affection is subject to considerable variation. When productive of extensive necrosis of tissue (e.g. in the glands of the nose and pharynx) the adjacent lymphatic glands are found to undergo simultaneous enlargement and infiltration this in scrofulous persons, often resulting in suppuration and destruction of the glandular structures concerned.

THE LUNGS.

The pulmonary tissue changes differ in no essential respect from the same occurring in the course of other ail-ments; but, nevertheless, Corneil and Babes (quoted by Williams - Trans. Med. Chir. Soc. vol LXX p 77) insist upon the existence of a form of pneumonia peculiar to measles, due to the direct action of the specific poison, and the sole cause of death in the suffocative variety of the disease.

It is said to begin as an interstitial pneumonia, at first involving the lymphatic system, the interlobular and interalveolar tissue, which later gives rise to a fibrinous effusion into the alveoli.

THE NERVOUS TISSUES.

The structural changes induced by measles in the nervous system, are at first, mainly vascular and result also from the direct toxic action of the circulating poison, after the manner of what occurs in diphtheria.

Note - The pathology of the various complications met with in measles - which at the best cannot be said to have any absolutely characteristic anatomic lesions - differ in no essential respect from that found when not associated with this disease. Certain points, however, of interest and importance will be noted in the chapter devoted to symptom-atology.

S Y M P T O M A T O L O G Y

Division of Symptoms into Stages. -

The advisability of describing the symptoms of measles under groups, dominated "periods", or "stages", is obvious, but it must be remembered that they represent the course of an average case, based upon the congeries of exper-ience of a large number of cases, embracing the maximum and minimum of duration and intensity of infection. By this means one is able to obtain a standard from which the course of a given case may be estimated or anticipated from all standpoints. Deviations from this, however, are quite common, and that, too, without real abnormality in the course of the attack, the so-called normal being only the average: this point cannot be too strongly insisted upon. With such qualification, description in stages may be proceeded with forthwith.

R U B E O L A V U L G A R I S
(Morbilli Regulares)

Regular or normal course.

(1) Stage of Incubation. (Statium Incubationis)

The period of Incubation may be taken to represent the time which elapses between the implantation of the infection and the development of the disease,. It may be as well to premise these remarks by by stating (1) that it lasts from seven to fourteen days, and in inoculated cases from seven to ten days; (2) that though conforming to certain rules of average and type, measles no more follows fixed lines of development than does any other form of infection.

The greatest divergence of opinion seems to exist amongst recognised authorities as to the length of the incubatory period, due to differences in conditions under which their test cases are studied.

The stage of incubation - according to Panum (loc cit.) lasts ten days; and this is also the view of Abelin, who observed that when a case of measles was brought into the hospital, the disease broke out amongst the other children in nine days.

Some estimate the duration of incubation thus: in families, where a child had introduced the disease, they noted the number of days from that of the illness or eruption of the first child to that of the same in the others. It is evident that this manner of reckoning does not afford any trustworthy estimation of the duration of the stage in question, since the beginning of the illness and the eruption are not always equally widely separated as to time, and the infection of the subsequent cases can clearly have ensued at very varying periods, namely, (1) before the illness of

the first child, from the same or another source, and particularly from the contagion in the clothes of the first child; (2) during the course of the disease of the first child, from the infectious material produced by it, and this either at any time of the prodromal or of the eruptive stage; (3) after the disease of the first child - or at least at a time when the child no longer diffused any infectious material - from the contagion which it had produced during its illness and which was communicated to the second child by means of inanimate objects or otherwise at second hand. Since, however, it may be taken for granted, from the great contagiousness of measles even during the prodromal stage, and from the great susceptibility to measles in those never attacked, that the infection will occur as soon as possible, we may expect in such estimations as the above, to meet no very varying numbers, and in the majority of cases to observe nearly the normal duration of the incubative period.

Pfeilsticker, proceeding on the assumption that the infection of those subsequently attacked took place on the first day of the prodromal stage, found an interval of from 13 to 15 days between the infection and the appearance of the eruption; Girard (with the exception of three cases where it lasted sixteen days) one of 13 to 14 days. In the six cases of Harnier, where the infection could only have occurred during the prodromal stage, the intervals during the eruptions were from 11 to 13 days. In a carefully controlled case by Rilliet, the interval between the first signs in two children was 12, that between the eruptions 10 days, and the rash of the second child appeared 15 days after the commencement of the prodromal stage in the first. Spiess, on the other hand, observed only the time of the outbreak of the two exanthems, and found the interval to be in 147 cases, 117 times between 10 and 14 days, 8 times in 9 days, and 22 times between 15 and 18 days. Salzmann found, - reckoning in the same way, - in 25 cases infected from a single source, 3 times in 9, 8 times in 10, 13 times in 11, and once in 12 days. According to Kerschensteiner, the exanthem of the second series in 37 families appeared 34 times between the tenth and twelvth days after the outbreak of the first eruption, and once each on the eighth, fourteenth, and fifteenth days. The obvious conclusion from observations such as these is that the average duration of measles is ten days; and an interval between the maxima of the exanthems of the infecting and infected children, which far exceeds the normal standard, may be explained by the at first slight and subsequently increasing susceptibility of the second child, so that it becomes infected by the contagion which still adheres to objects - it might, however, also be explained by an unusually long duration of the incubation. Against this last , on the other hand, is the fact that such a one was never yet confirmed by reliable observations - a further reason for labouring for the greatest possible augmentation of their number: it must also be remembered that some of the figures quoted have been derived from measles in adults, not in children.

It is obviously somewhat difficult to account for certain unusual observations; but the most feasible theory regarding the same is that the contagion adhered to objects which did not at once come into contact with the person subsequently affected. Thus Roux describes a measles epidemic, which broke out among the healthy occupants of a vessel 17 days after leaving port; Tuffnell, the isolated affection of a soldier who for 45 days had been in prison; in both cases the diagnosis seems certain. Possibly existing chronic diseases sometimes influence the duration of the incubatory period: thus, according to Mayr (loc cit) rickets. Emmert reports a case where a boy of ten, just recovered from acute rheumatism, had a severe attack of measles after an incubation of 17 days.

It is, furthermore, important to recognise a distinction between the constitutional and local symptoms in dealing with the early manifestations of measles; and judging from the diversity of opinion expressed thereon, this is not always easy. Thus (1) Bonn (In Gerhardt's "Handbuch" vol ii, pp 297-8) contends that the constitutional disturbances are rarely altogether absent from the incubation period of measles, whereas in the other acute exanthemata this is almost always a latent stage. An infected individual usually feels generally indisposed for days before the actual outbreak of the disease, though seldom ill enough to stay in bed. Children look pale, lose interest, are listless and sleepy, often complain of headache or pain in the stomach, feel nauseated, and have a poor appetite; at times they are feverish; but catarrhal symptoms do not regularly belong to this period. This much is clear - deducting all the time in which any indisposition is manifested, an average of only a few days remains for the absolutely latent germinating period of measles.

(2) Thomas (Ziemssen's "Handbuch" p 76) on the other hand, remarks that in the period of incubation, the infection normally remains completely latent; and that this period is distinguished therefore, by an absence of fever as well as of local symptoms.

These opinions are, paradoxical as it may at first sight seem, both correct and incorrect, taking pyrexia as a certain indication of constitutional disturbances caused by infectious processes. After careful study of temperature charts and taking an all-round view of the question, the writer scarcely believes himself justified in speaking of "signs of an infectious disease" - no matter what its order may be - in the absence of all local symptoms and of fever: hence the necessity of frequency in estimation of the temper--ature. Embden ("Eine Masernepidem. in Heidelberg in Jahre 1888" 1889) confirms the latter suggestion by his chart show--ing one of the children under observation to have had no rise of temperature before the appearance of the eruption, (nor were any local symptoms appreciable); in another case, moreover, the latter broke out only 24 hours after the initial pyrexia. Analysing the cases just mentioned, the probabi--lity of a greatly prolonged period of incubation, during which the infection remains latent, becomes apparent. It is difficult moreover, to fall in with Bonn's conclusions owing to the obvious doubt as to whether temporary disturbances manifested before the regular development of the disease are necessarily the direct result of the action of the measles poison (vide. Thomas, "Beitr. zur. Kenntniss Masern", Arch. der Heilk., 1867, pp 390, 391; and Henoch - "Vorlesung uber Kinderkr.") the presence of the latter in all probability may make the patient's system more sensitive to other influences. It is likewise a matter of regret that reliable analyses of temperature to determine these points have never been published. Thomas, indeed, states that he has seen temporary pyrexia - to 102 deg F - accompanied by slight constitutional disturbances and trifling catarrhs of the upper respiratory passages, during the time when the individuals in question were under the influence of the measles infection, the same being followed by several days of normal temperature and of improvement in local conditions, before the ordinary symptoms of measles began to develop in their regular sequence The temperature, he continues, was frequently slightly over normal during the period following infection, although no other signs of bodily derangement were present.

The common finding of an unusually early appearance of the catarrhal symptoms is to be explained on similar grounds to that of the early pyrexia.

Holt ("Diseases of Infancy and Childhood" New York, 1899, p 911) from an observation of 144 cases of measles

found the period of incubation to be most often 11 days, and to range from 11 to 14 days usually, this being, however, subject to great variation, as is evidenced by the following table from his treatise:-

Incubation	less than 9 days			3	cases
"	from 9 to 10	days		22	"
"	" 11	" 14	"	95	"
"	" 15	" 17	"	19	"
"	" 18	" 22	"	5	"

According to Haig Brown's studies of the disease - sixty cases - at Charter House School (Brit. Med. Jour. Apr 16, 1887. p 826) the incubatory period of measles was 14 days. Other writers, however, record an incubation as brief in duration as five days. Graham (Art. "Measles" System of Dermatology, etc, Morrow 1894, vol iii) has observed that in second attacks of measles the stage of incubation may be as long as from 18 to 21 days; but much shorter - 8 to 10 days - if the infection be conveyed by inoculation.

(II) PRODROMAL STAGE (Stadium Prodromorum)
or PERIOD OF INVASION.

The prodromal stage is ushered in by symptoms appertaining to the character of an ordinary coryza, accompanied by a watery discharge from the nose, sneezing, lachrymation and smarting of the eyes, photophobia, and irritation of the pharyngeal and laryngeal mucosa, giving rise, in the course of about 24 hours, to coughing and huskiness of voice. With this occurs a rise of temperature - usually from 2 - 3 degrees on the first day - which may be preceded by chills, or again - though rarely - rigors alternating with feeling of heat. According to Ziemssen and Krabler ("Klinische Beobachtungen uber die Masern und ihre Complication u. s. w " Greifswalder Med. Beitr. 1861 B, 2 S, 117), chills are but seldom present, as amongst a large number of measles cases they observed them only five times.

In children there is usually stupor and apathy of expression, and especially irritability and fretfulness; these may, and often do, alternate or vary during the differ--ent hours of the day and night.

An unpleasant taste in the mouth is always complain--ed of; and the tongue (which is never so much involved as in scarletina) shows its papillae swollen and projecting, a white fur perhaps covering its dorsum; thirst is apt to be distressing; dryness of the mouth and throat materially contribute to the general discomforts of the illness; and there is also marked anorexia, with sometimes obstinate constipation.

Temperature of the Prodromal Stage.

This cannot be regarded as characteristic owing to its vagaries; so that from it no special hint as to the character of the disease can be derived. Both it and the other symptoms being of gradual development, the transition between the incubation and prodromal stages is more or less indefinite; and a typical and distinctive temperature curve cannot in this disease be established.

A good deal, however, regarding the pyrexia of measles has been written, amongst which the studies of Winderlich (Ueber einige Verhaltn des Fieberverlanfes bes den Masern, u. s. w. ", Arch. der Heilkunde., 1863, S. 332) are particularly noteworthy, though his conclusions (at times decidedly contradictory) cannot always be accepted without reserve. Thus he contends: that the fever which in measles precedes the eruption and accompanies it up to its complete development is quite strictly typical in character. Since measles, however, is a disease the course of which is particularly subject to irregularities, certain epidemics being

distinguished by their eccentric type of infection, one must, of course, be prepared to meet with many deviations from the usual temperature curve. Measles, furthermore, is in the main a disease of childhood, when the temperature is more easily disturbed by accidental influences than at any other time of life. It is only natural, therefore, that cases should frequently display more or less well marked deviations from the type of temperature record which characterizes the uncomplicated action of the measles contagium on previously healthy, susceptible and not too irritable or sensitive individuals.

What usually happens in ordinary cases of measles is that - according to Thomas("Beitr. zur Kentniss der Masern", Arch. der Heilk, 1867) - with the onset of the prodromal stage the temperature rises rapidly, and so as a rule uninterruptedly, to a considerable height, certainly high enough to constitute true fever (102° to 104°F); it seldom remains below 102°F. The fever symptoms usually abate very appreciably on the following morning,- that is, on the second day of the prodromal stage,- the temperature even frequently falling to normal; exceptionally, it remains high for another twelve or twenty-four hours before the remission takes place. This initial fever, lasting on the average one day, is succeeded in most cases by two days of very light fever. On the first of these two days -- that is, on the second day of sickness -- the fever is particularly apt to remain low, whereas on the following day, the third, this applies at the most only to the morning hours, a further more or less well-marked rise of temperature seldom failing to occur in the evening.

Although the above applies to the character of the fever in the majority of instances it should be remembered that another,and pronounced, type of pyrexia is sometimes encountered. This is characterized by the same rapid initial, but not by the well-marked remission; the peculiar fluctuations of temperature corresponding to night and day observed in health are not effaced by the continued tendency of the fever to rise. In some case, furthermore, the fever of this stage merges, without notable remission, into that of the eruptive stage.

Second Day.-

During the second day of this stage the symptoms increase in severity and the face becomes markedly altered, either pale and puffy, or slightly livid or dusky, and at the same time the nose discharges an acrid secretion on to the upper lip and neighbourhood, from which partial or complete congestive occlusion may result. The catarrh spreading up the Eustachian tubes may occasion an annoying crackling, or, it may be, an actual deafness. The conjunctival lining of the eyelids becomes congested likewise, red, injected or oedematous, and numerous dilated capillaries are to be observed running across the sclerotic in all meridians: with this there is photophobia,smarting and considerable orbital suffusion. Such symptoms, however, do not prevail in all cases: at times the discomforts may be so slight as to escape attention altogether and the disease be only recognised on the appearance of the eruption.

Third Day.-

Sometimes with the dawn of the third day the symptoms subside; the appetite returns; and the patient seems well nigh recovered. Such respite, unfortunately, is nearly always of very short duration, with the result that towards the evening there is a sharp rise of temperature and a return of the symptoms with even greater intensity. So far the illness may have been mistaken for a common "cold", and

and that too in spite of the presence of a certain amount of croupy or coarse dry cough; accompanying or following which are wheezy chest sounds, sibilant rales, also slight dyspnoea, and a sense of constriction about the chest.

The parotid and submaxillary and thyroid glands are usually found to be somewhat tender, as well as more or less enlarged; and children are sometimes observed to be delirious towards, or during, the night. Convulsions are, however, rarely met with except in markedly neurotic individuals. Epistaxis, though somewhat common, is seldom severe. Affection of the throat is usually evidenced by a certain amount of tonsillitis, causing pain in swallowing; whilst, in addition to this, laryngitis and laryngismus (the latter especially in young children) may be noticeable to an alarming degree.

The Eruption on the Buccal Mucous Membrane.-

Flindt's Observations.- During the second and third days onwards of the prodromal stage there will be found on the buccal mucous membrane an eruption which has been subjected to painstaking investigation by Dr.N. Flindt , of Denmark who in the Reports of the Danish Board of Health, 1880, describes its appearance and course to the following effect:-

First Day of Fever. A slight diffuse erythema of the throat.

Second Day of the Fever. A fairly dark redness without marked oedema of the posterior pharyngo-palatine arch and tonsils, which on the anterior palatine arch and velum palati, is somewhat less deep in colour and of irregularly diffused or mottled appearance. On the evening of the second day of the fever the mucous surfaces of the tonsils, and the posterior palatine arch, have undergone little or no change, appearing as a uniformly red erythema, with slight oedema. On the anterior surface of the soft palate, and the posterior part of the hard palate, as well as occasionally on the remaining mucous surfaces, a distinct exanthem appears. The lesions are round or irregular in shape, of a bright-red colour, having an ill-defined margin, with little or no elevation at this time above the surrounding surface. In places there is a tendency for the lesions to cluster in groups and to become blended. They acquire a peculiar appearance on account of the numerous small, white, glistening points, - simulating minute vesicles,- which occupy the middle of the small, red macules. These manifestations in the macules are irregularly grouped. One can see and feel the minute vesicles elevated above the surrounding areas. The palpebral conjunctiva is hyperaemic in its entire extent. Besides the reticular and macular reddening of the conjunctiva, which is due to the disposition of the conjunctival vessels, there are also small, glistening, miliary elevations, similar to the elevations in the palate.

Third Day of the Fever.- The mucous surfaces of the buccal cavity, which, up to this time, have been only slightly hyperaemic, are now found to be invaded by the lesions previously described. These latter are strongly marked over the entire anterior surface of the velum palati, the glosso-palatine arch, and usually also over the contiguous two-thirds of the hard palate. The red spots are sometimes very numerous, at other times isolated, and again, by blending, they form irregular figures of a stronger red than previously seen. Here and there a faint appearance of the previously described vesicle-like formations is seen projecting above the surrounding surface. On the other hand, they may also be found on the normal mucous membrane. Similarly grouped spots with whitish vesicles now also appear on the inner surface of the cheeks, especially on the part opposite the juxtaposition of the upper and lower molar teeth. As a rule,

the gums and inner surface of the lips retain their normal colour, or at the most are only slightly hyperaemic. It is, indeed, seldom that the eruption appears on these parts. The tonsils and both pharyngo-palatine arches still remain red. The palpebral conjunctiva retains its deep red colour, but no spots are visible excepting the minute vesicles previously described. At this time the eruption breaks forth on the skin. On the evening of the third day there is little or no change perceptible.

Fourth Day of the Fever.- On the palate and inner surface of the cheeks the spots stand out prominently. while in many places there is a tendency to merge by enlargement of the individual lesions, and on the surfaces last invaded they are more copious than ever. The conjunctival exanthem is now disappearing. On the evening of this day there is no change noticeable.

Fifth Day of the Fever.- The exanthem in the buccal cavity is more marked than heretofore. Frequently at this time there appear faint reddish spots on the mucous membrane of the lips, even extending to the exposed cutaneous margin. On the gums they are seldom present and never distinct. The hyperaemia of the posterior fauces remains unchanged. The skin exanthem begins to fade, and the temperature falls.

Sixth Day of the Fever.- The exanthem on the mucous surfaces is no longer visible, except a slight diffuse redness of the palate and the inner surface of the cheeks. Fever ends

This characteristic exanthem is seldom absent: its presence in at least 90 per cent., of all cases - according to Slawyk (Deut Med. Woch., Apr., 28, 1898) - may be safely anticipated; but it should be borne in mind that it may disappear from haemorrhagic effusion into the individual spots and immediate neighbourhood of each. As the blood becomes absorbed light coloured spots marking the points of haemorrhage may remain for a variable period.

Koplik's Observations.-

The characteristic appearances (and their diagnostic value) produced by the spots (now generally termed "Koplik's Spots") with such constancy upon the buccal mucous membrane has been specially described by Koplik (Archive of Pediatrics, New York, Dec., 1896; and Med. Rec., New York, 1898, LIII, 505-507) in a lengthy dissertation, in the course of which he states that scant attention is given to the most important elements of the eruption as it appears on the mucous membrane on the inside of the cheeks and on that of the lips. A thorough understanding of the eruption on the buccal mucous membrane will aid in separating an invading measles from a mass of eruptions resembling measles which appear on the skin in infancy and childhood. Looking into the mouth during this stage of invasion, one observes a redness of the fauces perhaps, not in all cases, a few spots on the soft palate. On the buccal mucous membrane and insides of the lips a distinct eruption, consisting of small, irregular spots of a bright-red colour, is invariably observed. In the centre of each spot there is noted, in strong daylight, a minute bluish-white speck. These red spots with accompanying specks of bluish-white colour, are - according to Koplik - absolutely pathognomic of the beginning measles, and when seen can be relied upon as a forerunner of the eruption. Koplik states that, before the publication of his observations, no one had called attention to the pathognomonic nature of these small bluish-white specks, and their background of red, irregularly shaped spots. They cannot be mistaken for sprue, because they are not so large nor as white as sprue spots. These specks of bluish-white surrounded by a red area are seen on the buccal mucous membrane and on the inside of the lips, not on the soft or hard palate. Sometimes only a few red spots, with this

central bluish point, may exist - six or more; and in marked cases they may cover the whole inside of the buccal mucous membrane. If these bluish-white specks on a red spotted background are at the height of their development, they never become opaque, as sprue, and in this respect when once seen, are diagnostic, nor do they ever coalesce to become plaque -like in form: they retain the punctate character.

The eruption just described is of the greatest value at the very onset of the disease, the invasion. As the skin eruption begins to appear and spreads, the eruption on the mucous membrane becomes diffuse and the characters of a discrete eruption disappear and lose themselves in an intense general redness. When the skin eruption is at the efflorescence, the eruption on the buccal mucous membrane has lost the character of a discrete spotting and has become a diffuse red background with innumerable bluish-white specks scattered on its surface. The mucous membrane retrogrades to the normal appearances long before the eruption on the skin has disappeared.

TESTIMONY OF OBSERVERS.-

Libman (Med. Rec., June 11, 1898) attaches great diagnostic significance to Koplik's spots, as he found them present in every case (50) specially investigated; and states that the more abundant the exanthem, the fewer in number will be the spots, and that he has never seen anything exactly resembling them in other diseases, although the eruption of ~~the~~ purpura and of secondary syphilis were at first sight somewhat difficult to distinguish.

Knospel (Prag. Med. Woch., Oct. 13, 1898) directs attention to the fact of an exanthem of the buccal mucous membrane having been described by pediatrists long before the time of Koplik - Flint for instance, q. v.- but allows that since Koplik has shown a new feature - their early appearance before the outbreak of the cutaneous eruption - the credit of their diagnostic interpretation is very properly his, and from his observation of them in 41 cases, believes their significance established.

Finckelstein (Berl. Klin. Woch., p, 605, 1898), having seen the spots in five cases in which they were specially looked for, admits their value in arriving at an early diagnosis, more especially from influenza.

Slawyk (Deut. Med. Woch., 1898, No. 27.) finding them present in no less than 45 out of 52 cases examined, states that there are usually 6 to 20 on a side - in exceptional instances on one side only - sometimes, indeed, hundreds: that they are usually in greater number near the lower molars; and that under the microscope he found them to consists of buccal epithelium in a state of fatty degeneration.

Havas (Wien. Med. Presse, 1899, No. 24) found Koplik's Spots present in 15 out of 16 cases studied, and, in size, frequently larger than described by Koplik, often quite equal to that of a lentil. When examining close to the gums he was able to discern the presence of a bluish-white deposit upon them. He insists that their pathognomonic interpretation cannot be negatived.

Manasse (Munch. Med. Woch., June 5, 1900) maintains that too much reliance cannot be placed upon their supposed pathognomonic value, as he has seen measles without Koplik's spots, and the latter without being followed by the former.

Hirsch (Phila. Med. Jour., 1900, VI. 343.) believes the sign to be of special value in diagnosing measles in the negro, in whom it is obvieusly, impossible to always make out the rash. He was able to detect Koplik's spots in every case (50) examined.

Cotter (Arch. of Pediatrics, 1900, XVII) gives a somewhat qualified opinion as to the value of Koplik's spots; from a study of 187 specially selected cases at the New York Foundling Hospital. Firstly, with regard to the regularity of their appearance, he found that in eight patients they did not appear at all; in ten their presence was doubtful; but in 169 they were easily appreciable. Secondly, with regard to the priority of appearance of the spots, he reports it was synchronous in 78 cases; in 88 cases the spots preceded the eruption (from 1 to 5 days before); while in two cases the rash came out before the spots: and in no single case was the sign the sole evidence of the disease.

Ross (Columbus Med. Jour., XXIV, 1900) Asserts that the trustworthyness of the sign is almost absolute: it was present in every case (15) studied.

Lorand ("Jahr f. Kinderh.," 1901, iii, 658) states that (1) in 175 cases of measles he failed to discern the spots in 11; of the 92 cases studied in the prodromal stage, 3 had no spots; (2) in 348 other cases they were absent in 19, and that in all these negative instances better illumination than was at his disposal might possibly have revealed them.

Sobel (New York Med. Jour., 1898, LXVIII, 556) places no reliance upon the spots, as he has never seen them in a single instance.

Priority of Discovery.-

As far back as the year 1806 Willan ("Diseases of the Skin", London, 1808) drew attention to spots, resembling those described by Koplik and Flindt, about the buccal cavity, on the fourth day of the fever: these, from the palate uvula & tonsils, merged, on the fifth day, forming a bright red surface extending backward to the fauces.

Heim (Bemerkungen uber die Verschiedenheit deu Scharlachs, der Rotherin, und der Masern, u.s.w." Jour. der praktischen Heilk., C. W Hufeland und K. Hunley, herausgeber, 1812, Stuck IV, S. 86), in 1812, was able to distinguish between then enanthem (buccal spots) and the exanthem (cutaneous eruption) of measles, stating that usually there appears in the mouth on the second day of the fever small bright-red spots (Kleine hellrothe Flecke), which he regarded as of the nature of those which appeared later on the skin.

In 1854, Forbes (In Dunglison's "Cyclopaedia of Practical Medicine", 1854, vol., IV, p. 53), describing the eruption of measles, stated that the eruption spreads over the face, and that spots may also be observed on the palate and fauces.

Trousseau (Clin. Lectures, p, 171), in 1864, describes the early appearance of the buccal spots and their relation to the subsequent cutaneous eruption, and in no uncertain terms, for he states that "before there is any exanthem on the skin you see the disease inscribed on the pharynx, tonsils, and veil of the palate".

Rehn (Cited by Niemeyer - "Practice of Medicine", 1876, vol., ii, p, 528), in 1876, drew attention to an eruption of pale-red, somewhat undefined spots on the mucous membrane of the cheeks, gums, lips, and fauces.

Since the above particular attention has been drawn to the prodromal enanthem of measles by others, notably by Mayr (1852), Ziemssen and Krabler (1861), Barthez and Rilliet (1854), and Monti (1873), and all as it will be observed prior to the publication of Flindt's and Koplik's investigations.

Bolognini's Sign.-

Another peculiar symptom of the prodromal stage and one which Bolognini ("Jahresb. uber die Leistungen and Fortschritte in der Gesammt. Medicin, " 1898) considers as pathognomonic of measles, is that of a fine crepitation, or friction, as if tw o bottles were rubbed together, whnn the pulps of the fingers are applied with gentle pressure to the relaxed abdomen. To obtain the sign, therefore, the patient is placed upon his back, with the legs flexed and the abdominal muscle relaxed; the pulps of the three middle fingers of both hands are applied to the abdomen and gentle pressure, gradually increased, is made with a kneading movement, when a slight rubbing sensation will be conveyed to the fingers, which disappears a s the pressure is increased. Koppen (Ibid) found the sign in 50 per cent., of all cases examined; and Bolognini himself failed to elicit it only twice in 200 cases. He, moreover, states that it disappears with the outbreak of the cutaneous eruption, and that it is due entirely to vascular disturbances of the peritoneum analogous to the enanthem as observed on the mucous surfaces. In spite of all this, however, it is now realized that little reliance can be placed upon it, owing to its presence in affections other than measles.

Duration of the Prodromal Stage.-

The duration of this, the stage of development, is usually four days (from three to five days); but it has sometimes been observed to be much shorter, because the first slight affection of the nasal mucous membrane often appears some days before any other symptom, and may then entirely escape attention. In this case it is only when the more severe catarrhal symptoms, attended with fever, set in that the presence of the disease is detected. On the other hand, in persons previcusly in ill-health, and particularly in those who are rachitic, tuberculous, or scrofulous, this stage may be prolonged to a remarkable extent, so as even to last ten days (Troussean - loc. cit).

Holt (loc. cit) in 270 cases - mostly children - studied, found the prodromal stage to be:-

1	day (or less)	in 35 cases.
2	days	" 47 "
3	"	" 64 "
4	"	" 64 "
5	"	" 29 "
6	"	" 20 "
7	"	" 6 "
8	"	" 2 "
9	"	" 2 "
10	"	" 1 case

In adults the period of invasion seems to vary less: Roger (Rev. de Med., April, 1900, p. 290) found it to be shorter than in children over two years, and longer than in infants.

II. ERUPTIVE STAGE (STADIUM EXANTHEMATICUM VEL FLORITIONIS) OR PERIOD OF EFFLORESCENCE.

Date of Commencement.

The eruptive stage usually commences on the fourth, rarely the fifth. day of the fever, when the remittence and intermittence of the prodromal pyrexia cease to be replaced by the continuous elevation of temperature characteristic of the acme of the febrile affection.

Temperature.-

The maximum temperature will be observed to have been reached, in this stage, as a rule. some thirty-six hours after its commencement, and this in nearly every typical instance corresponds with the maximum of the exanthem, or at least with the first stage of it: it is quite exceptional to find the acme of the pyrexia attained near the beginning of the eruptive stage. The acme of temperature is usually observed to last from $1\frac{1}{2}$ to $2\frac{1}{2}$ days, corresponding conversely with duration of the prodromal stage, so that the maximal temperature occurs with considerable regularity at the end of the fifth or sixth day of the illness. The period of the maximum of the exanthem, and with it of the maximal temperature, is more constant than the duration of either the prodromal or the eruptive stages, each of which compensate for the other. The time which elapses from the moment of infection to the maximum of eruption (about 15 days) appears to be still more uniform, so that this interval, or rather the shorter one has been employed by certain writers, only to the beginning of the interruption, for the estimation of the duration of the incubation. The temperature at this time very rarely rises above 105°F., though a temperature of 110°F. has been reported by Hunter (Brit. Med. Jour., April 30, 1898), in a child of sixteen months who nevertheless recovered.

The Eruption.-

The eruption shows itself in milder cases on the morning, in more severe cases only in the evening, of the fourth dayof the fever. The evening preceding the fourth day, however, if the skin be carefully examined a faint mottling or roughening may be detected over the points about to be occupied by the spots. To find the eruption appearing on the third or the fifth day is quite exceptional. It may be expected to appear first upon the upper part of the forehead, on the temples, behind the ears, and on the sides of the neck, in that order, though occasionally all simultaneously; soon spreading to the orbit, mouth and chin, in the form of punctate spots, - not unlike those occasioned by flea-bites, - and of the precise colour which is obtained by adding a little yellow or brown to a red pigment, that is, a medium red.

The appearance of the eruption invariably gives rise to a marked intensification of the symptoms, the catarrh increases, the cough becomes vastly more distressing; respiratory sounds may be shrill and harsh; and swallowing is apt to be more painful. The patient will complain of a sensation as if his eyes were filled with sand; and photophobia may be so acute as to occasion much persuasion to allow of inspection of his face, which he keeps buried in the bedclothes and as much as possible in the dark.

The fever is now observed to be gradually increasing in intensity, with slight morning remissions, gaining one-half to one degreee each evening.

A certain amount of epistaxis may be observed at this period, but it is seldom in excess of a mere oozing.

The initial constipation may now give way to a very severe catarrhal diarrhoea, and if this be left untreated - especially in debilitated persons - dangerous complications may appear.

The minute and scattered spots upon the face do not remain long in that condition; for as early as the second day the whole face, neck, upper pectoral region, and back, may be covered with them. Their appearance may be either singly or in groups, forming - according to Willan (loc. cit) - crescents, or irregular, broken circles. Before this, however, that is during the first day of their presence, they may show a great resemblance to the rash of urticaria, and be elevated above the surrounding skin, their redness momentarily fading on pressure. In the ripe condition the spots vary in size from one millimetre to one centimetre (1/24 to $\frac{3}{8}$ inch) in diameter, ranging from two to three millimetres (1/12 to $\frac{1}{8}$ inch).

The eruption consists of circumscribed, slightly raised spots, often presenting a slight central elevation. In colour they may even assume a dark red, later a purplish tint, or finally a distinct dusky violaceous hue - termed by the laity "black measles". The skin between the spots remains intact, although the face, viewed from a distance, seems to have a puffy, oedematous appearance. It shoud be noted, moreover, that the lesions are not always round, but may be of almost any shape compatible with their size, e.g. attenuated, notched, crescentic, and so forth. In every case, at first, the sharp definition of the spots against the surrounding skin is very characteristic, the elevation of the lesions being easily determined even by sight - especially at the acme - and remains until desquamation is complete. The central elevation which especially demarcates the spots is not, however, always present: generally speaking, the heavier the rash the more papular is its character - this papulation being attributed by Unna (loc. cit) to a condition of passive oedema induced by a previous spastic contraction of the muscular coats of the blood-vessels from the action of the special poison thereon.

The fact of the development of the eruption in independent spots deserves special notice as strongly indicative of their presence in the circumscribed form being due to a circulating contagium vivum acting only where it lodges; for were it simply a solution in the blood, - and always so - the lesions would necessarily be of uniform distribution: as suggestive of this the fact of Eberth's bacilli having been isolated from the typhoid roseolae may be noted.

Forms of Eruption.-

Mention is made in the literature of the following five forms of measles eruption named according to their macroscopic characteristics:-

1. Morbilli Laeves,- The usual form of eruption, consisting of red spots with a small central elevation.
2. Morbilli Papulosi.- An eruption in which the central elevation of each spot is nodular, the spots themselves being of a deep red colour.
3. Morbilli Vesiculosi s Miliares.- An eruption of spots covered with minute vesicles, resembling "goose-flesh"
4. Morbilli Confluentes s. Conferti.- An eruption of Confluent spots.
5. Morbilli Haemorrhagici.- An eruption. characterized by haemorrhagic effusion. into and around the individual spots.

Attention, however, should be more directed to the general course of the disease then to the varieties of eruption (the first four will be described later), which, being due to trophic cutaneous disorder, allow of no special prognostic interpretation (Furbringer - "Measles" in Eulenburg's "Real-Encyklopadie", u. s. w., Vienna, 1887, 2nd Edn., vol XII, p, 55) and this is particularly true as regards the hamorrhagic variety, for as Veit ("Ueber hamorrhagische Masern", Voichow's Archiv, vol XIV, p.86) remarks, several forms of haemorrhagic effusion into the rete Malpighii and corium are not infrequently encountered in cases of haemorrhagic measles. There are the isolated, sharply circumscribed, blackish tinged, small, round petechial; more frequently large ecchymoses, preserving the shape and size of the former spots of rash. Sometimes the effusion takes the form of long, irregular streaks (vibices)., sometimes that of large plaques (purpura haemorrhagica). Any of these different forms may be seen alone, or two or more may occur in the same individual. Only a few parts of the body may be involved, or the haemorrhages may be distributed over more or less of its entire surface. The colour of the affected areas when fully developed varies from purple to black, subsequently passing through the changes characteristic of the absorption of extravasated blood. They may last for a few days or several weeks. At times the ecchymoses may be accompanied by epistaxes, and without bleedings from other parts. The early appearance of the haemorrhages, usually within the first few days, is an especially important indication of their dependance on the measles eruption, and calls for a strict differentiation from a petechial process which may develop some weeks later, after the rash has entirely disappeared. Veit, still further, emphasizes the fact of the abatement of the fever pursuant to the appearance of the petechiae as well as the general improvement in the patient's condition when this occurs; and, accepting his views, the general conclusion is as to the certainty of there being both a benign and a malignant form of haemorrhagic measles.

The fading of the exanthem first takes place from the parts where it first appeared and vice versa; and in spite of its sometimes brightening (becoming more distinct) after fading - due to a rise of temperature - it cannot be held to ever undergo a renewal.

Concomitant Symptoms.-

Together with the development of the rash, the catarrhal symptoms increase in character; the nasal discharge becomes saro-purulent; the cough loosens; moist rales are audible; and the sputum is frequently copious, as well as nummular or sero-purulent; the patient suffers from more or less prostration, the pulse is quickened and the breathing may become hampered. It is at this time especially that a careful watch should be kept for bronchitis and pneumonia, which are responsible for a high mortality at this period.

The abdominal symptoms - usually those of severe diarrhoea of a catarrhal or choleraic character - are almost always prominent, and may be accompanied by great tenderness on pressure, or of a mild peritonitic character. With this, headache is usually distressing, but vomiting is a rare accompaniment.

The urine is seldom markedly altered. Brown contends that the urine may become albuminous when the eruption develops rapidly, and that this albuminuria generally occurs on the third day. Becqueral, on the other hand, states that he has never seen any evidence of albuminuria, even in cases in which the kidneys were known to be congested. There seems

no reason, however, why a slight temporary amount of albuminuria should not occur at the acme of the fever, in consequence of the excessive increase of temperature, more rarely of a slight desquamative nephritis, in favour of which is the fact that now and then a profuse exfoliation of the epithelium of the urinary apparatus is observed. In spite, however, of Abeille having twice reported albuminuria in the course of rubeola lasting for 7 and 18 days respectively, an essential participation of the kidneys, as in Scarlatina does not occur in Measles. The usual urinary changes common to all acute fevers - increased urates, scantiness, and darkening - always, of course, occur; in addition to which the diazo-reaction may be obtained, acetonuria and peptonuria detected, and a certain amount of vesical irritability be experienced.

III. STAGE OF DESQUAMATION (Stadium Desquamationis) OR PERIOD OF CONVALESCENCE.

The commencement of this stage marks the decline of the disease, so that when the disease runs its ordinary course febrile symptoms are altogether wanting.

As early as the second day the constitutional and other symptoms begin to subside, and sometimes even before that.

The lesions upon the mucous membranes have by now usually entirely disappeared, or at least give rise to no special symptoms.

The redness of the various mucous surfaces fading away may leave some evidence of desquamation - in the mouth chiefly.

The cuticle of the skin now becomes detached in the form of branny scales, which make their appearance first on exposed regions of the body, that is on the face, neck, and upper part of the chest, in the order named. On the face, however, the degree of exfoliation of the epidermis is only moderate, and is most noticeable about the temples, sides of the nose, and chin; but it sometimes happens that a considerable desquamation takes place over the entire body. As a rule profusity of exanthem and of desquamation coincide, though the latter may be rendered almost imperceptible by frequent cleansing of the body and baths. On the other hand again, with an equally severe eruption there may be no desquamation; or with a mild exanthem, on the contrary, some exfoliation may take place.

The almost invariable branny nature of the scales is due to the exfoliation taking place only on the site of the spots, larger scales occurring only with confluent exanthems, but, even then, never to the same extent as in scarlatina, and never, in measles, does the skin peel off in large lamellae from the fingers, palms, toes, and soles of the feet. Desquamation may occur very early, a few days after the acme of the eruption, while the redness of the spots still exists: at another time it only appears after their complete fading. The exfoliation process lasts, as a rule, several days, but rarely protracts itself into the second week, or disappears as early as in one or two days. In both appearance and duration, therefore, a consdderable uncertainty exists after the total disappearance of the eruption a certain amount of pigmentation may remain for a week or two on the sites previously involved.

A certain amount of prostration is still experienced and the patient being very sensitive to cold and draughts he should be kept indoors for a week or more, that is, from three to four weeks from the commencement of the illness.

RUBEOLA ANOMALA.

A TYPICAL, IRREGULAR, or ANOMALOUS, FORMS OF MEASLES:-

Measles does not always follow the normal curve described, which is observed in mild epidemics. In children especially, many cases are met with in which there are irregularities in the length of the different stages, or modifications of various kinds in the symptoms. Thus, even in healthy persons the period of incubation is often prolonged two or three weeks, without there being any apparent cause to which the occurrence may be assigned; and the same thing happens still more frequently when the individual is already the subject of disease, and particularly with children affected with some affection of the nervous system, or with some anomaly of nutrition. Again, in patients suffering from any of these complaints the prodromal stage may be prolonged so as to last a week or even ten days, the period of latency being, in this case, of normal duration; and, in exceptional instances either of the other stages may be protracted in a similar way. Edgar (Canada Med. Rec., Dec. 1892) states that in an epidemic of 423 cases, he found only 123 which adhered to the regular type. Hence the modifications of measles require to be described in detail: for convenience sake the following method will be adopted.-

(A) MILD FORMS.-

(Rubeola Benigna)

I.Measles without Catarrh. (Morbilli sine Catarrhs).-

In such cases the catarrhal symptoms are slight or entirely absent (Harris - Lancet, Feb. 21, 1891), and as there is usually less fever - or other concomitants of the prodromal stage - this variety of attack is sometimes termed "morbilli sine febre". Such cases, nevertheless, though at first sight unimportant, are not so, as they are, in spite of their mildness and imperfect development, genuine cases of measles, in other respects quite normal.

2. Measles without Eruption. (Morbilli sine Morbillis)

The possibility of measles occurring without characteristic lesion in the way of skin eruption, is maintained by many writers, particularly the older ones, who devote considerable space to describing what many now-a-days are inclined to regard as a very doubtful or abstract quantity. The writer candidly admits that, in the course of a considerable experience of measles, he has never seen a case of this variety; but owing to the great attention devoted by others to it he intends to give due weight to the variety of opinions vaunted regarding it.

In order to accurately recognize the presence of measles without eruption, Bohn (Gerhardt's Handbuch", p, 307) states that the enanthem should be carefully sought for and examined, and that if this fragment of the eruption, at least, is always to be found, the case in question cannot, of course, be diagnosed as morbilli sine morbillis. What usually is considered as appertaining to this variety is when, even in primary attacks, a case is encountered where the disease runs its ordinary course, in respect to catarrhal symptoms and fever, up to the time when the eruption should

appear, and then comes to an end without showing either an eruption or the fever characteristic of the eruptive period. Such a case, therefore, would be distinguished by the presence of the first half of the regular measles fever from others which present an irregular course of temperature.

According to Embden (Cited by Williams, Art., Measles", Twentieth Century Practice of Medicine", New York, 1898, vol XIV, p, 133) no less than 4.3% of the cases studied by him (20 out of 461) failed to display any eruption; that most of them were mild, and severe manifestations extremely rare. The lack, here as when elsewhere reported, of individual descriptions demands that such instances should be only accepted with reserve.

The case of measles without eruption reported by Rillick (loc. cit). happened to be a very severe one, and occurred in a child of 21 months old infected from two others in whom the disease had run a normal course. The fever and concomitant catarrh were observed to be of the ordinary kind; but instead of the expected eruption developinga double lobar pneumonia appeared on the fourth day and spread very rapidly, to be followed by a keratitis, and death of the child on the eighth day of the disease.

Desquamation has even been stated to occur in non-eruptive cases, as witness Seitz's statement (Medicinisch Corresp. bayer Aerzte, 1844, No. 12, p. 181) that a few times he saw cases presenting all the characteristic symptoms of measles except that no eruption was visible on the skin, but were followed, nevertheless by (partial) desquamation. In such an instance, however, -where the skin affection was sufficiently severe to cause desquamation - the eruption had probably been overlooked.

3. Variety in the Localisation of the Exanthem.-

In spite of the eruption of measles appearing in regular and characteristic succession upon different parts of the skin, this does not always happen. Instead of breaking out upon the face, the exanthem may first be seen upon some distant part of the body. Thus, if the patient has been lying for some time on one side it may commence on that arm; if ointments, plasters, or lotions, have been applied to the chest, it may present itself first in that region; if any part of a limb is compressed by tight bandages, or articles of clothing, the rash may make its appearance at that spot. Again, in cases in which the exanthem appears upon different parts of the body in regular order, it may be very imperfectly developed. Thus, its presence may be confined to the face and trunk, no trace of it being seen on the limbs, this being moreover observed chiefly in cases of spinal disease, in which the eruption is often altogether, or, at any rate, very nearly absent on the paralysed lower extremities. In some cases of measles, also, independently of the presence of any other disease, the exanthem is almost limited to the face and neck, the spots being so sparingly distributed over other parts of the body that they can be easily counted; and this is observed chiefly when an epidemic is either beginning or just about to subside.

Formerly much weight was attached to the import of irregularity in localisation and order of the eruption in measles. Thus, according to Henoch ("Vorlesungen uber Kinderks 3d Ed., p, 671), when the rash, instead of spreading in the usual manner, from the face downward towards the feet, first breaks out on the chest or back, and then develops irregularly in all directions from this point the course of the disease is very apt to be unfavourably influenced by complications, or by previously existing general bodily weakness; but this sign, however, does not exist in all cases.

It is now generally believed that no matter where the cutaneous lesion appears, or how spread, the course of the disease is quite uninfluenced thereby. Trivial causes may determine this, and any local irritation - such as tight bands - may occasion the first appearance of the spots on the part in question.

4.Varieties in the Duration of the Eruption.-

The eruption especially when the catarrhal symptoms are of extraordinary severity - not infrequently remains visible for a week or ten days, but in such cases, however, it usually undergoes certain changes in colour, the original yellowish or brownish red colour passing into a bluish or dark brown tint, which no longer fades on pressure. These spots of pigment are not infrequently observed in patients suffering from some other eruption, such as eczema, lichen, scabies or pityriasis; but if the skin were previously healthy, these spots must be regarded as being due to the presence of some severe internal disease.

It happens sometimes that one comes across a case of what is termed the "retrogressive form" of measles, in which the rash prematurely disappears or suddenly fades, either when it should be spreading further or when at its height; thus, according to the lay mind, driving the poison from the skin to the internal organs, as it were, by a metastasis to the internal parts. This belief, however, cannot be substantiated by facts;, for, internal affection is always present even before the retrogression of the eruption, showing that this is the cause, and not the effect, of the disappearance of the rash. The cause of the phenomenon lies probably in either (1) the fact that when the general circulation is seriously interfered with - usually in consequence of the extension of the catarrhal inflammation to the small bronchi and the secondary involvement of the lungs - the blood supply is diminished; the latter becomes paler all over, the spots of rash which were previously outlined grow less distinct, but still remain visible, and both the eruption and the skin in general take on a somewhat bluish tinge; or (2) that the contagium of an acute infectious disease circulating in the blood of the tissues may be stored up in one or other of these according to its individual proclivities, where sooner or later it is excreted or rendered inert as a result of the activity of the cells with which it comes into direct contact; in measles the effects of poison are seen in the skin and mucous membrane in which tissues it is also probably destroyed, - the infectious stream being conveyed in both directions, first, as a rule, to the mucous membranes, and then to the skin; the inflammation of the former, however, is not usually in the least decreased by the outbreak of the exanthem; and it is, still further, conceivable that under certain circumstances a larger proportion than usual of the poison may be diverted to the mucous membranes, causing an excessive inflammation of this tissue, while the skin is left comparatively unaffected. The important point to be noted in this connection is not so much the so-called retrogression of the eruption, but rather how much it spreads at the time severe respiratory symptoms have begun to manifest themselves, the latter sometimes appearing very early in the course of the disease. The question, however, must remain somewhat open, and only the future can decide it, for it is evident that the circulatory disturbances in the skin dependent on the bronchitis can curtail the action of the measles poison in the skin only, as manifested by the less severe reaction of the latter than normally occurs: it is not a question, therefore, of the poison already present in the skin being driven out of it, but of

the exclusion from this tissue of part of the quantity which ordinarily is carried in it.

Relapsing Measles.-

In rare cases, and after the rash has disappeared, a second attack or relapse is said to sometimes occur: this is most usually the case at the end of the second week, and is accompanied, moreover, by elevation of the temperature and the return of the catarrhal symptoms. The literature contains many instances of this, as the writings of Feltz ((Gaz. Hebd. de Med., 1896, Nos. 84 & 87) Fischer (Corresp. - bl. f. Schm. Aerzte, Sept. 15, 1898), Lemoine (Bull. Med. Jan, 1,& 8, 1896), Roger (loc. cit. p, 294), Sevestre (Bull. Med., Jan. 1 & 8, 1896), Lippe (Cited by Thomas - loc. cit.) Loschner ("Jahrbuch f. Kinderh.," 1868) and Spiess ("Frankf. Jahresb. uber die Verwalt. des Med. Wes., Krankenaust" 1867, XI, p, 40), testify. Trajanowsky (Dorpat Med. Ztschr., 1873, III) describes another form of relapsing, or recurrent, measles in which the primary exanthem is slight and accompanied by high fever, lasting from six to eight days, followed by an interval of normal temperature lasting about eight days. This. however, may have been nothing more than relapsing fever accompanying measles - a common finding in countries where the former is endemic; and many of the so-called relapses of measles are doubtless systemic disturbances induced by complications, or attacks of rubella only, rather than reintoxication of the system by the contagium vivum.

5. Varieties in the Appearance of the Cutaneous Eruption.-

(a) Morbilli Laeves.- This is the form usually described as typical, and the only one in most epidemics.

(b) Morbilli Papulosi.- This form of measles in certain epidemics replaces the usual variety ("Blattermasern" of Bloest); and in it there appear dark red, or reddish-brown, points, or papules, the size of millet or hemp seeds, containing pigment, and seated at the mouths of hair follicles. In such cases the rash is at first apt to be mistaken for variola than which, however, it is much darker.

(c) Morbilli Vesiculosi seu Miliares.- Here the mouths of the hair-sacs, from being filled with fluid exudation, become raised, and form delicate, transparent, miliary vesicles, giving to the skin a peculiar appearance, resembling that seen in miliaria; and it is probable, moreover that in these cases the peculiarities of the eruption are in part produced by the same cause, to which is attributed the formation of the vesicle of miliaria, being due either to profuse sweating or pyaemic conditions.

(d) Morbilli Conferti seu Confluentes.- In this variety of eruption the spots (as explained by the name) are either crowded together, or confluent, the result of the formation of the papules in such large numbers that the intervals between them are reduced to nothing, or exist only at the time of outbreak of the eruption. As a matter of fact, moreover, there subsequently appear continuous red patches, of considerable extent, but strictly circumscribed, and with deeply indented margins, the same being observed chiefly on the face, back and limbs. Even in these cases, however, the real nature of the disease can always be determined, for at some point or other some spots can be found at which the eruption is of the ordinary kind, and consisting of distinct maculae: even in the youngest infants the rash never covers the entire skin uninterruptedly. To this form of measles is to be ascribed, the "Exanthema hybridum" of Schönlein, named by him "rubeola", in which a

scarlatiniform rash is associated with the concomitant symptoms of measles.

(e).Morbilli Haemorrhagici.- Enough has already been said regarding this variety elsewhere.

6. Varieties Consisting in the Combination of other, Acute or Chronic Skin Affections with the Rash of Measles.

Susceptibility to the contagion of measles is by no means negatived by the existence of some chronic skin disease; for children suffering from such are observed to contract measles with as great facility as without it. In these cases the pre-existing skin affection disappears for a time, but only whilst the rash of measles is out, and desquamation is usually very abundant, but this does not, however, prevent the return of the chronic skin affection which, on the other hand, is apt to prove even more serious and intractable than hitherto.

Scarlatina and variola have both been reported as existing with measles, but here, obviously, the diagnosis of the latter will be somewhat difficult and uncertain.

Bullae and wheals are common enough with measles in addition to the rash; which latter is sometimes even accompanied by a general erythema. This is, however, of very evanescent nature, due probably to the patient being kept too warm, and can be easily determined from (1) its irregular mode of development and of involution (2) from its arising at any stage of the disease (3) its being unattended by febrile disturbance, and (4) its not spreading completely over the entire skin. It is, still further, more apt than not to appear in patches on the chest and abdomen, as well as on the limbs, and, after one or two days, disappears without having perceptibly modified the pre-existing exanthem or leaving an effect behind. The rubeola Schönleinü - the hybrid Scarlatiniform exanthem, referred to - is in all probability an eruption of this kind, appearing during the eruptive stage of measles, the more so as it is never epidemic, being invariably reported in the sporadic form.

(B) SEVERE OR MALIGNANT FORMS.

(Rubeola Maligna).

That certain forms of measles may take on a malignant tendency is the experience of almost everyone. Edgar (loc. cit) in his report of 423 cases of the disease states that 103 were of the malignant kind, 7 of them dying from complications. These cases are usually found amongst the debilitated, living under adverse conditions, and exposed to vicissitudes of season and weather. Thus, a malignant form of the disease is common amongst soldiers and others living in tents, hence the designation of "Camp measles" which this variety receives.

The variety described above, in which the eruption spreads over the entire skin simultaneously, though regarded by some as of a malignant type, is not so as it does not appreciably influence the death-rate; and it is common enough in children.

The retrogressive form of measles has been mentioned elsewhere, and is a severe one apart from the recession of the eruption, the latter not being per se unfavourable.

The Typhoid or Ataxic Form.- This variety occurs in certain epidemics, especially in persons under bad hygienic conditions, and especially amongst troops on campaign, or during the hardships of siege. In such the symptoms partake of an extremely alarming character, being accompanied by hyperpyrexia, quickened pulse, accelerated respiration,

dryness of the tongue and lips, diarrhoea, anuria, convulsions or delirium, prostration, followed by death, in a comatose condition, about the third or fourth day of the eruption. On the other hand, however, the symptoms may subside, and recovery be uninterrupted.

The Suffocative Form.- This is the term used to indicate the class of cases in which the brunt of the attack falls upon the respiratory organs, producing thereby a severe hacking cough, dyspnoea - even in the prodromal stage - or cyanosis; mucous râles are in evidence from the first and daily intensify, so that - especially in children - the malady is apt to merge into one of capillary bronchitis, with, in them, death from heart failure; in adults, from syncope. As might be expected from previous remarks, in this, as in other visceral affections, the eruption assumes the retrogressive character.

Haemorrhagic Forms.- Haemorrhagic, or "black measles" (morbilli haemorrhagica), concerning which something has already been said, exists in two forms; in one - the mild form - the hamorrhage seems to have little or no influence upon the disease; in the other the reverse holds and the patient seldom recovers from it.

(a) The Mild Form of Haemorrhagic Measles.- According to Holt (loc. cit., p, 915) who reports it in 5 per cent of all cases, and Edgar (loc. cit) who encountered it in 47%, this variety is a common one, but more so in some epidemics than others. The disease is of very sudden onset, the appearance of the cutaneous discolouration being the first special phenomenon to attract attention. The rash now assumes a purplish tint, which does not disappear on pressure, and the pigmentation is either confined to the spots, or appears in the form of numerous dots or petechiæ - in size from a pin head to a lentil - in the sound skin between the maculae. The extravasations may be confined to either the lower limbs, or the trunk, the arms, neck and head remaining free, but, more often the whole body assumes a bleeding tendency; as also the mucous surfaces causing epistaxis, and haemorrhage from the gums, rectum and genito-urinary tract. In spite of this, however, recovery usually occurs (the lesions gradually resolving) but convalescence may be very protracted; or, again, the disease may merge into the malignant type.

(b) The Malignant Form of Haemorrhagic Measles.- This variety, common enough two centuries ago, is seldom encountered now-a-days, owing, it is believed, to general improvement in social and hygienic conditions. Even now, however, in those specially predisposed to it by the haemorrhagic diathesis, it may be observed, and its possibility in such must not, therefore, be overlooked. It usually makes its appearance during the prodromal stage in the form of a severe nose-bleed, which with other haemorrhagic symptoms (of which there may be any grade of severity) get worse as the eruption appears, which later, again, is apt to assume the retrogressive form on the second, sometimes the first, day, leaving in its place a variety of cutaneous maculations of any hue from purple to black. With this there is great prostration, as well as muscular prostration; and possibly abolition of sphincter control with haemorrhages from the gums, bowels and genito-urinary tract. The usual symptoms of profuse bleeding are manifested by the altered condition of the pulse and respiration, and the patient usually dies in a state of collapse within 48 hours from the onset.

Causes of Severity of Type.-

Owing to the importance of the subject this question calls for special consideration. Some there are who attach great weight to errors in diet and treatment, basing

their opinion upon observation of the greater severity of type in former times, losing sight of the probability of many of the epidemics in question having been in fact those of scarlatina, unrecognised as such perhaps from defects in diagnostic procedure: others again were undoubted those of rubeola and from the careless way we know the disease, two centuries or more ago, to have been treated, the etiologic interpretation of the factors mentioned in malignity of type must be apparent.

A well known instance of this appears in the records (Sigaud, 111) of the epidemics of measles which occurred (1) Amongst the natives, on the banks of the Amazon, in 1749, where the number of deaths amounted to 30,000, whole tribes being annihilated; (2) in Astoris, in1829, where about one-half of the natives succumbed to the disease (Moses) (3) Amongst the Indians of the Hudson Bay Territory, in 1846 (Smellie) (4) Amongst the Hottentots at the Cape, in 1852 (Scherzer; (5) Amongst the natives of Tasmania, in 1854 and 1861 (Hall); (6) and in Maritius and the Fiji Islands, in 1874 (Lancet, June, 1875, p, 865). Regarding the last two epidemics it appears that the great mortality was in a large measure due to the fact that the sick were exposed to the most unfavourable conditions. Unprotected from exposure, unattended and untreated, chiefly in consequence of their own unhappy prejudice, every complication of the disease must have been invited and rendered intense; in accordance with this view, it was found that those classes of the native population over whom adequate supervision could be exercised suffered only slightly. The same facts were reported by Smellie in the malignant epidemic of 1846, among the natives of the Hudson Bay Territory; of all those who were received into Fort York and there received medical treatment, not one died. Much the same is apparent from the report by Squire (Med. Times and Gazette, Mar. 1877, p, 323) of the destructive epidemic of measles in the Fiji Islands, which was known to have been introduced from Sydney by the suite of King Kakoban, and which carried off 20,000 of the natives, or one-fourth to one-fifth of the entire population of the Fiji group. Squire, treating of this famous epidemic remarks that the favourable progress of the early native cases negatives the idea of any special proclivity. Cruikshank, who treated 143 of the native police, reported only 9 deaths, most of these resulting from evasion of needful precautions. Later in the epidemic, when it was observed to possess a virulence equal to that of plague, the natives, terror-struck abandoned their sick; and only one death occurred amongst a number of cases treated in separate rooms with satisfactory attention. The natives chose swampy sites for their dwellings, and whether they kept close shut up in huts without ventilation, or rushed into the streams and remained in the water during the height of the illness, the consequences were equally fatal. Squire, still further, adds that the excessive mortality resulted from terror at the mysterious seizure, and from the want of the commonest aids during illness; thousands were carried off by want of nourishment and care, as well as by dysentery and congestion of the lungs; and that no special susceptibility of race or peculiarity of constitution, can be regarded as sufficiently explanatory of the frightful mortality.

Further proofs of the disastrous influence of unfavourable hygienic conditions upon the type of measles are to be found amongst civilized peoples. Thus, during the epidemic which prevailed in 1866, among the Confederate troops at the time of the American Civil War, there were 1900 deaths out of 38,000 cases of measles. In the course of the official report of this epidemic ("Medical History of the Rebellion", Philad., 1865, p. 127) it is stated that the disease re-

sembled ordinary measles in adults, except when aggravated by the effects of crowding, poisoning, or other depressing influences; and that in two large hospitals, the mortality amounted to 20 per cent of the sick.

Another instructive example is afforded by the epidemic which prevailed during the seige of Paris in January 1871, out of 215 of the Garde Mobile, who contracted measles, 86 (40 per cent) died. The mortality reached very nearly the same figure among the French troops who returned to Paris after the Italian War, 40 out of 125 cases dying in one hospital - where the sanitary conditions were of the worst possible kind - with severe intestinal symptoms (Laverau - "Gaz. hebd. de Med.", 1861 No. 2).

Again, with reference to the virulent epidemic of measles amongst the troops of the National Army of Paraguay, it seems that the disease swept off - at the beginning of the Brazilian-Paraguayan War - nearly one-fifth of the National Army in three months, not from the severity of the disease, but from want of shelter and proper food (Masterman).

COMPLICATION AND SEQUELAE.

Measles is said to be complicated when any of the symptoms observed during its regular course become so severe as to constitute an independant affection. They must necessarily greatly modify the development of the disease, or delay, or retard, its progress. Complications are commonly observed : Haig Brown (loc. cit.) in 60 cases of measles found complications and sequels in 48. The more important complications retard the recovery from the disease, and may give rise to grave conditions, which continue for an indefinite period, and are known as sequelae.

General Causes of Complications.-

1. Individual Peculiarity.- A person the susceptibility of whose system is of a suitable sort for germination and development of the measles contagion is particularly liable to complications, especially inflammatory lesion of larynx, trachea, and lungs. The same "morbid tendency" is observed in persons of a tuberculous or scrofulous taint.

2. Surroundings. Under this heading it may be noted that defective sanitation, careless or unskilful nursing, and the like may be the cause of various complications, which do not make their appearance in those placed under more favourable conditions.

3. Epidemic Peculiarity.- It is a matter of common observation that certain epidemics exhibit great tendency to produce complications and in this the greatest variety exists.

THE SKIN.-

Erythema.- Erythema has been already noted to occur during the prodromal fever; but it may also be observed at the acme of the exanthem, especially if the patient be kept too warm and the eruption is severe. Meyer - Hoffmeister observed a scarlatiniform erythema even during convalescence; Hauner frequently saw one resembling an acute lichen. The erythema may be either more or less intense and diffuse over the whole body, or limited to a single region. Thus, for example, Gerhardt reports having seen it located to the region of Scarpa's triangle. It is of short duration and fades with the appearance of the general eruption.

Miliary Vesicles.- As a result of free prespiration - especially in children - miliary vesicle are sometimes observed; they are in reality of the nature of sudamina, and are usually to be found in greatest abundance about the neck, axilla, scapular region, and inner surfaces of the thighs, especially when these parts bear a profuse rash. Apart from the intense itching which they at times occasion and occasional pustulation, the general course of the disease is not influenced by them.

Eczema.- Eczema is an occasional complication, and in persons specially predisposed to it, considerable trouble may afterwards be experienced in getting rid of it.

Psoriasis.- During the desquamative stage, or shortly after, psoriasis may be observed, excited, perhaps, by measles in a predisposed subject.

Impetigo, Furunculosis and Phlegmonous Abscesses.- These are induced by the access of micro-organisms to the subcutaneous tissues through disrupted points in the cuticle: they are, however, of somewhat rare occurrence, and seldom occasion the suppurative processes observed in variola.

Bullae.- The development of a bullous eruption in the

skin, and on the mucous membranes has been reported by Loschner (loc. cit), Du Castel (Rev. gen. de Clin. et de Therap, Paris, 1897 XI, p 609) and Baginsky (Arch. f. Kinderh H. I & II, B., 28, 1900) and others. Steiner ("Jahrb. f. Kinderh." New Series, vol VII, p. 346) uses the term "morbilli bullosi vive pemphigoidei" to designate the disease presenting this condition, the inaptness of which, and its origination from other infectious processes, have been pointed out by Henoch ("Zur Pathol. der Masern", Berl. Klin. Woch., 1882 p. 193). Such cases must be very rare, Steiner reports four instances from amongst 6000 cases of measles; and Henoch one only in the course of a lifetime. Steiner's four cases are of considerable clinical interest; they all occurred in rapid succession in the same family; the bullae varied in size from a pea to a pigeon's egg; they were stretched tight by their contents, which at first consisted of a clear or slightly turbid fluid of alkaline reaction, increasing in turbidity later on. The skin of the affected parts seemed little altered, sometimes showing a red border around the base of the bullae; crusts formed after the bullae broke, but there was no cicatrisation. The process attacked any part of the body, sometimes one sometimes another, without reference to the presence of the measles eruption; of the mucous membranes, those of the mouth, the nose, and the inner surfaces of the labia majora were affected. The bullae appeared in successive crops, not at all in connection with the measles eruption, sometimes developing before the latter, sometimes at the same time or following it, but always persisting at the time of desquamation. The bullous process was accompanied by fever, independant of that due to the measles infection.

In Henoch's case, however, the bullae were of much larger size, so that a single one covered each cheek, and they were so plentifully distributed over the body that the epidermis was lifted up, as if it were the seat of extensive burns. Henoch, therefore, regards the condition as due to a complication of measles with acute pemphigus, which is to be ranked among the infectious diseases.

The literature contains a few other examples, amongst which is one reported by Romberg ("Die Masernepidemic in Tubingen im Sommer, 1838) in which the skin under the bullae became gangrenous. This case possess a specialy interest in that the patient recovered, an unusual happening for the reason that pneumonia almost invariably carries off the patient.

Gangrene &c.- Various parts of the body may be attacked by gangrene as a result of measles; and it generally arises when the fever has subsided even should it be associated with some complaint arising during the febrile stage of the disease, it does not in any way modify the exanthem, and is therefore, a sequel; the only form of gangrene which is properly speaking a complication of measles is that which affects the lungs.

Other eruptions are occasionally developed, espedially herpes facialis in the eruptive stage; at which period also one occasional ly comes across other cutaneous lesions, as; pemphigus and abscesses, and Zoster femoralis (Thomas loc. cit.)

Lupus.- Tuberculosis of the skin, according to Du Castel (loc. cit.), more commonly follows measles than is generally supposed; and in addition to his findings we have the sequel reported by Adamson (Brit. Jour. of Dermatology, 1889, p.20) Haushalter (Annal. de Derm. et de Syph., 1898, t. IX, No. 5 p 455): inoculation of guinea-pigs with portions of the lesions, by this observer, giving rise to tuberculosis in these animals.

The malady is said to be widespread, attacking the

face, upper extremities; as well as the trunk and legs,- but to a minor degree,- appearing in the form of small deep red nodules, which later on present larger patches of the size of a shilling-piece, due to the coalescence of the original nodules, which latter, early in appearance, are observed to assume a more or less chronic tendency, and after absorption leave the characteristic lupous cicatrix.

Urticaria.- This, with herpes and other dermatoses - already noted - is a common result of the early irregulation of the nerve centres in measles by peripheral stimulous from the digestive tract Claus (Jahrb. f. Kinderh. u. Phys. Erzieh., June 5, 1894) reports two cases of the malady appearing during the incubatory period of measles.

THE MUCOUS MEMBRANES.-

The various lesions produced by measles upon these structures (which of all are the most susceptible) have already received detailed consideration.

THE EYES.-

Conjunctivitis seem s to be a regular feature of measles, and when severe may lead to serious destructive lesions. It is, therefore, of the utmost importance that these parts receive painstaking attention during an attack of measles. The following are, the principal according to Eversbuch ("Behanal der bei Infectionskr. verkom. Erkrank. des Schorgans". "Handbuch der Spec. Therapie inner. Krankh.", Jena, 1894, vol I. p. 605): (1). Blepharospasm, in consequence of a highly developed photophobia: this may give rise to a subsequent myopia. (2) Inflammation of the lachrymal gland (3) Hyperaemia of the conjunctiva and catarrhal conjunctivitis: this lesion is characteristic of the measles infection, but not infrequently persists after the latter has subsided, and takes on a severe form (4) Necrosis of the cornea and central purulent infiltration. These lesions are ascribed to poor circulation and bacterial embolism, or to the implantation of bacteria from without on the cornea, which in its reduced state of nutrition offers a favourable site for their growth. (5) Marginal ulcers of the cornea. (6) Weakness of accommodation; paralysis or spasm of the ocular muscles. (7) Affections of the optic nerve, taking the form of amblyopia or amaurosis; atrophy of the nerve may develope later.

THE EARS.-

The inflammation of the nose and pharynx so constant in measles may extend along the Eustachian tube, and so reach the middle ear; carrying along with it the pyogenic bacteria Streptococcus pyogenes, and the staphylococcus albus and aureus. Should the patient remain in the recumbent position the free escape of accumulated secretion becomes retarded, leading to the development of a highly virulent and infective pus, and this condition of otitis is perhaps, next to the laryngeal and pulmonary lesions, the most serious of all morbillous complications. As a rule the following are the more common aural complications of measles - (1). Acute catarrh of the middle ear: this is the form most commonly observed, and it is seen in a large percentage of cases in some epidemics, sometimes developing early in the disease, but usually not until the stage of desquamation. (2). Severe purulent otitis media: this is not at all a rare complication.
(3) Necrosis of the labyrinth from invasion of cocci, resulting in a serious loss of function power: a not more infrequent complication (Burkner - "Behand der bei Infec-

tionskr. Vorkomm Ohraffectionen" p, 581).

The occurrence of aural complications may entirely escape notice until actual suppuration has taken place. On the other hand, however, the patient may complain of intense, agonizing, pain in the ear, accompanying which is great restlessness, grinding of the teeth and sudden cries in children, with delirium (in adults). As a rule the aural mischief is noticed about the end of the second week of measles, although, as Tobeitz (cited by Williams - loc. cit.) insists, it may be recognised post-mortem as early as the first day of the cutaneous eruption and is usually well marked by the fourth day. Auroscopy usually reveals in these cases signs of myringitis, the tympanic membrane being lustreless, with a yellowish point at its lower segment indicative of subjacent pus. Should bulging result the drum not infrequently ruptures, an occurrence in these cases to be hoped for, allowing of the evacuation of the pus and preventing the extension of the septic process inwards. At the necropsies of 16 cases of otitis media Bezold (Munch. Med. Woch 1896 Nos., 10 & 11.) found in the tympanic cavity to be filled with muco-pus; in a few extending to either the mastoid autrum or the mastoid cells, in one case with necrosis of the Eustachian tube; and in all with intense congestion of the aural mucous membrane, and haemorrhages here and there. The involvement of the Eustachian tube (and its early closure) is a serious matter, being productive of mortality from retention of sepsis, or its extension to the antrum, or mastoid cells, with cerebral extension resulting in meningitis, cerebral abscess and pyaemia; the same being in children, facilitated by the patency of the petro-mastoid suture allowing of free access of pus to the cranium from the middle ear. Downie (Brit. Med. Jour. 1894, vol ii, p, 1163) states that in 501 cases of tympanic disease measles was responsible for 131 or 26.1 per cent. The occurrence of cerebral extension is manifested in these cases by the patient lapsing into a comatose condition from which he may not rally, a happening to be carefully guarded against, but unfortunately not always possible as the otitis of measles is singularly lacking in the pathognomonic signs of ear disease . That permanent deafness, or, short of that, impairment of hearing, may result as has been noted above, and is an established fact. Addison ("Deaf-Mutism": a Clinical and Pathological Study" Glasgow, 1896) states that of 1410 deaf-mutes in Great Britain, 138, or some 9.8 per cent, were traceable to measles; in American institutions, of 1673 cases, 53, or 3.1 per cent, and on the European Continent, 84, or 4.2 per cent., have arisen from the same cause.

The Respiratory Tract.-

The Nose.-

The fact of the frequence with which catarrhal inflammation affects the nasal mucous membrane need excite no alarm as it is not usually of much consequence. In infants, however, this part of the respiratory tract becoming occluded may indirectly - by necessitating mouth-breathing - be responsible for nutritional defects.

Nose-bleedings. are fairly common during the time of the exanthem, and perhaps more so when the exanthem appears, and being usually slight, and relieving head-ache, are rather salutary than otherwise. Should, however, the epistaxis be part and parcel of the haemorrhagic diathesis, the matter becomes much more serious and has been known to terminate fatally.

Specific pyogenic processes may, of course, occur in the nares as on other parts of the abraded mucous membrane: this is uncommon: and a marked distinction from a similar pro-

cess in scarlatina lies in the infrequency with which the pharyngeal lesion spreads into the nose in the case of measles.

The Pharynx.-

The pharyngeal membrane, to some degree or other, is invariably involved in measles; and the eruption which occurs thereon has already received due attention. It may be specially noted here, however, that the inflammation nearly always remains superficial and simple, although other complications have been observed, most important of all, diphtheritic inflammation. This but seldom extends to the larynx, one instance being reported by Embden (loc. cit. p. 20) amongst 10 cases of pharyngeal diphtheria noticed amongst 461 cases of measles. It is only in severe epidemics that complications of this kind are observed at all.

The Larynx.-

1. Laryngitis.-

Laryngitis, in children especially, is met with as a common and dangerous complication of measles, and in one or other of three forms; -

(a). Spasmodic Laryngitis, or "false croup" is the most common of the laryngeal complications of infants, the peculiarity being a minor degree of inflammation in association with a disproportionately great muscular spasm. A spasmodic, sometimes incessant, cough is almost invariably suffered from, and it may in tone resemble a bark, and have with it a whistling inspiratory sound. The spasm occasioned by attempts at swallowing are frequently alarming, but only for a time, as the condition quickly subsides with the ripening of the rash.

(b). Acute Phlegmonous Laryngitis.-

In this variety of laryngeal lesion, the inflammatory process is much more severe, and the patient is unable to phonate beyond a whisper, and from this even he refrains owing to the great pain attending the procedure: palpation is likewise painful; the expectoration is usually blood-stained; but the cough is either entirely absent or much less troublesome than in the former variety. Laryngeal ulceration and gangrene not infrequently follow, resulting in necrosis and destruction of the vocal cords; and, in these cases only, fatal oedema glottidis.

(c). Membranous Laryngitis.-

Membranous laryngitis, or croup, occurs as a complication chiefly in children (most under three years of age) living under conditions of overcrowding and sanitary defects; and is characterized by the formation of a grayish-white false membrane on the laryngeal lining (due it is supposed, to infection by pyogenic micro-organisms, more especially the streptococcus) which may extend upwards to the fauces, or downwards into the trachea. This complication makes its appearance anytime from the fourth day up to the end of the second week of the eruption; and is attended by a peculiar shrill cough; voice-whisper; paroxysmal dyspnoea, which may or may not destroy the patient by asphyxia. Granlou (La Rugeole a l'Hospice des Enfants Assistes", Paris, 1892, IV) at l'Hospice des Enfants Assistes, found, amongst 1633 cases of measles, the condition in 235, with a mortality of 218: amongst the 1398 cases which escaped membranous laryngitis, the deaths amounted to only 388.

II. Diphtheria.-

Diphtheria in its relation to membranous laryngitis is still sometimes a matter of dispute: the former is due, as already noted, to pyogenic cocci, the latter to Klebs-Loefflers bacillus. Adriance (Archives of Pediatrics, Feb.,

1900) states that 36 out of 96 cases of measles, in the Nursery and Child's Hospital of New York, suffered from this complication, with a mortality of four. Instances are described by Spiess, Abelin, and others. from which one may take it that the course of the malady is that of simple primary diptheria. It may, when starting in the tonsils, remain thereabouts, or spread from thence to the larynx, trachea, and even into the bronchi,or begin at the larynx and extend upwards and downwards, or affect this alone, and so on; According to Rothe, it can, if of moderate extent lead to slower or more speedy recovery, while it usually proves rapidly fatal if the air-passages are early complicated. Diptheria usually appears at the acme of the eruption of measles, or soon after; and, in mild cases, apparently exerts no influence upon the character of the rash; but in severe cases - when the air-passages are greatly affected and the appearance of the diphtheria is temporarily coincident with that of the exanthem, the latter becomes changed as in the case of broncho-pneumonia, when then, moreover, generally sets in as a further complication. The normal course of the pyrexia of measles being affected by every severe complication, it is no matter of surprise that with the onset of diphtheria the temperature shows markedand protracted elevation. The condition can be recognised by the usual symptoms, inspection, cough, hoarseness, and, the consequence of the narrowing of the lumen of the larynx, or other adjacent parts affected.

In New York City, from the fact of diphtheria being endemic it is the invariable rule, especially in large institutions, to consider every case of persistent laryngeal stenosis as diphtheritic, with the result that it is the established custom in these institutions to give immunising doses of antitoxin (200 to 500 units) to infants and young children in the prodromal stage of measles; and the great lowering of the death-rate thereby has amply justified the procedure.

Before leaving the subject, however, it may be noted that diphtheria affects other parts, in measles, besides the throat and larynx. Thus, Mason records diphtheria of the eyelids; Hauner - of the conjunctiva; Schreiber - of the prepuce and female genitals; and Ravn and Aarestrup,- secondary diphtheria of the nose, oesophagus and eyelids, with parenchymatous nephritis as a sequel.

THE LUNGS.-

I. Bronchitis.-

(a). Phlegmonous Bronchitis.- This is a variety of bronchitis which attacks by preference young strumous persons, and consists in a subacute inflammation of the trachea and larger bronchial tubes, which may continue long after the measles has been recovered from; leading not infrequently to tuberculosis.

(b). Capillary Bronchitis.- This constitutes a much more common and serious complication of measles, occurs, by preference during the eruptive stage of the disease; and is recognised by a continuance of the pyrexia after the fading of the rash, or by headache, vomiting, chill, elevation of temperature, severe cough, frequency and impediment of respiration, followed, in due course, by dyspnoea and prostration. The physical signs are those common to the condition whenever occurring.

II. Bronchopneumonia.-

This constitutes by far the most frequent and fatal of all the complications of measles. Houl (Wi. Klin. Rund., 1897, vol XI, p, 833) reports it in one-fifth of all his cases; and Holt (loc. cit.) during two epidemics in the Nur-

sery and Child's Hospital, New York (embracing 300 cases), in 40 per cent., of which 70 per cent died. It seems to be particularly common in foundling institutions and asylums; and bacteriologic investigation has demonstrated its origin in the micrococus pneumoniae of Frankel and the pneumococcus of Friedlander.

With the appearance of broncho-pneumonia the eruption disappears, in addition to which chill, rigor, pyrexia and weakness, acceleration and irregularity of the pulse are observed. The respirations become short and frequent, the cough hacking, or spasmodic and uncontrollable, attending which will be the usual signs of the adynamic state and developing pneumonia. It is especially important that an incipient pneumonia be recognised: amongst the signs which may be regarded as suggestive are the following: (1). Apathy, with mental dulness, and prostration - toxaemia. (2). Pyrexia, increased beyond the normal morbillous curve (3) Disturbed pulse respiration rate: the normal being 1 to 4 - or 20 to 30, with a temperature of 99°F - the ratio in a developing pneumonia may be, for instance, 1 to 3, with a temperature of 104°F, the respirations rising to 40, the pulse to only 120. (4) Rales, fine and localised, in addition to the coarse rales of general bronchitis. (5) Diminished respiratory murmur over the affected portion of the lung. (6) Broncho vesicular respiration. (7) Dulness on percussion.

After the development of the complication, the symptoms and physical signs in no way depart from the classic. It may be noted, however, in young children its onset is acute, with rapid pulmonary congestion, terminating fatally within two or three days, and that in older children or adults the pneumonic affection usually pursues a more subacute course, is more frequently of the lobar variety, and sometimes leads to the so-called caseous pneumonia, or pulmonary phthisis.

THE DIGESTIVE TRACT.

The mucous membrane of the digestive tract is frequently the seat of important complications, of which simple ulcerative, and aphthous stomatitis and glossitis are rare, and gingivitis, more common (Dusevel, Weil, Thore, Hartmann & Pank). Merteus reports in infants the occurrence, upon the lips, gums and tongue, of a thrush-like pseudo-membranous affection, occasioning so great a rigidity of the tongue as to interefere with suckling, increased salivation, on the authority of Erichson, is occasionally encountered during the prodromal stage, as well as in the eruptive. Weil reports stomatitis, and, with Heyfelder, the occurrence of parotitis . Before the appearance of the eruption, severe parenchymatous tonsillitis - giving rise to intense dysphagia may be observed. Severe gastric affections are rare, but intestinal catarrh, of varying severity, are frequent, and it is extremely difficult to know exactly when a mild diarrhoea ceases to be merely that and becomes a complication; for it is probable that in measles the intestinal mucous membrane participates normally in the general congestion of the skin and superficial mucous membranes. Thus, diarrhoea begins very frequently in the prodromal stage, or on the first day of the eruption, not so often during the same, and least frequently during the stage of retrogression, though these last cases are apt to be most severe. The diarrhoea begins with or without previous indigestion, is painless or at times associated with colic, and passes rapidly and harmlessly away; or, especially after laxatives have been used for preceding constipation, it may last with great violence for even a week or more. In the case of young children, in whom, moreover, these intestinal complications are most frequent, death may ensue even in

mild epidemics, and this occurs especially under the influence of hot weather, with gradual disappearance of bile from the stools and the appearance of even true choleraic symptoms. Or, again, if the large intestine be especially attacked, a dysenteric, or mucous, character manifests itself in the stools, accompanied by much tenesmus. Occasionally, however, one reads of severe epidemics in which even in winter, and adults, a fatal result appears to have been due to intestinal complications; or where, short of fatality, the same seriously threatened the life of the patient. As a rule the intestinal affection, since it seldom depends upon marked anatomic lesions, heals soon after the fading of the exanthem, upon the duration and course of which, as upon similar conditions of the fever, it exerts no influence except when it appears unusually early and produces by its great intensity a cholera-like collapse. The unfavourable influence exerted by the diarrhoea of measles appears to depend especially upon the fact that it lowers the vital resistance of the patient, and renders him less potent to resist the onset of the further complications. Besides epistaxis, haemorrhages also occur in the prodromal stage; and, later, from the rectum, and even from the kidneys and genitals. According to Roger (Presse Med.,Paris 1897, ii, pp 189 & 192), secondary infection may occur from the intestinal tract, leading to phlegmonous hepatitis, perihepatitis, and pleurisy.

THE NERVOUS SYSTEM.-

The frequency of complications in measles, involving the nervous system depends more on individual peculiarity than on the severity of the attack; and, in spite of the nerve centres being irritated in nearly every case of the disease, serious affection is of rare occurrence. According to Cioffi (Riforma Med., 1900, 51 to 53), and his theory has met with considerable acceptance, the morbillous toxin exercises a marked influence upon the vagus; when severe at first irritating, then paralyzing it. Others, again, contend that the frequency of the various catarrhal conditions - especially purulent otitis media - is due to irritation of the meningeal branches of the vagus, which at first gives rise to catarrhal symptoms, and which, in turn, predisposes to simple and tuberculous phlogistic affections.

Chorea.

Chorea is perhaps the least common of all sequelae of measles, and even when reported its etiologic association with measles seems to admit of considerable doubt. Stephen Mackenzie (Brit. Med. Jour., Feb. 26, 1887, p. 425) has collected 439 cases of chorea in which he asserts that measles was a precursor in 116, or 26 per cent; in 32 or 7 per cent. rubeola was the sole antecedent.

Disseminated Myelitis.-

This rare complication of measles seems most usually to occur with the development of the exanthem; it runs an ordinary course. In the case studied by Williams ("Trans. Med. Chir. Soc.," Vol LXXVII, p, 57) and Barlow (Ibid., vol LXX, p. 77) Vascular disturbances of the spinal cord were discovered at necropsy.

False Disseminated Sclerosis.-

This complication of measles seems somewhat more common than the foregoing, and is most apt to occur in hyperpyretic cases. The symptoms at times appear to point to an acute ascending paralysis, like unto that observed in other acute febrile disorders; and in these it is

of rapid onset, and the patient may die in a state of coma. Should, however, he rally from the latter, he is apt to remain either aphasic, paralytic, paretic, or ataxic; but from these recovery is rather more common than is usually supposed. Again the maladies mentioned may give way to a condition differing only from true disseminated sclerosis in that the symptoms are retrogressive rather than progressive, with a marked tendency to recovery. Williams (loc. cit.) mentions paralysis of the soft palate, pharynx, tongue and cervical muscles, which in four cases appeared at the commencement of the morbillous attack, and in four others not until after the lapse of four weeks, recovery in all taking place in from three to twenty days. Similar recovery is reported by Barthez and Senne ("Traite cliniq. et pratiq. des mal. des enfants", Paris 1891, t. iii, p.38) in cases in whom the paralytic symptoms appeared early in the disease, in others as sequels three weeks after the commencement of convalescence; dysphagia and dysphonia in many remaining permanently.

Hemiplegia.-

From this affection, common as it seems to be, recovery is the rule. Lop (Centralbl. f. Klin. Med., 1893 No. 50) considers that paralysis with or after measles may be classified in two divisions: (1) the cerebral, and (2) the spinal. Hemiplegia is, however, much less common with measles than with scarlatina. Thus, Osler ("The Cerebral Palsies of Children," London, 1889) out of 120 cases of hemiplegia states that four followed measles and seven scarlatina; Gowers ("Manual of Diseases of the Nervous System" London, 1888, vol ii, p, 423) 7 after each of these diseases. The malady is, still further, most likely to be observed as a sequel than as a complication: thus, of the 9 cases mentioned by Williams, it appeared during the height of measles in 4 cases, in 4 during convalescence, the time of onset in one not being specified. It is more common in females than in males; from the first day to the third week, and is often preceded by general or local convulsions.

Insanity.-

Mental disorder of an apathetic nature is occasionally seen to follow an attack of measles, and this, in those predisposed by insanity, imbecility, epilepsy, convulsions and so forth, may become chronic. Beach (Brit. Med. Jour., 1895, vol II, p. 707), reporting upon 2,000 cases of idiocy, states that 37 (1.85 per cent) followed one or other of the acute exanthemata, of which measles was responsible for 11, that is over 30 per cent. Bond (Maryland Med. Jour., Jan. 20. 1898) describes the occurrence of acute mania on the eighth day of measles; and Finkelstein (Vrach, No. 20, 1898) two case s of the same condition. Mugnier mentions a peculiar form of mental aberration immediately after the appearance of the exanthem; Christian, transitory mania with paralysis; Weber, delusions about persecution in the delirium of the collapse; and Neureutter, severe mental symptoms of a varying nature.

Muscular Atrophy.-

As a sequela to paralysis, muscular atrophy has been recorded. Thus, Coote (Cited by Williams - loc. cit) describes it so, and leading to club-foot; Ormerod("Brain" London, 1885, p. 335, vol, VII) reports three cases of the sequela in one family - father and five children.

Tetany.-

A condition of painful tonic and symmetrical spasm of the muscles of the upper and lower extremities in very young children or infants, - especially in those who have

previously suffered from convulsions, - has been observed to follow measles.

Other Diseases.-

Amongst the other diseases of the nervous system, for which measles has been held responsible are :- (1). Meningitis. (Spiess, Meyer-Hoffmeister, Constant, Thore, Krug, Voit, Kellner, Loschner, Bufalani) ; (2) Meningitis with tetanic and cataleptic rigidity of the limbs (Meltenheimer); (3) Acute hydrocephalus (Kronenberg, Weil, Heyfelder, Hayden, Pheilsticker. Schallenmuller); (4) Chronic hydrocephalus, Aggravated by the measles attack, and consequently fatal (Heinecke); (5) Universal paralysis after gangrene (Bourdillat); (6) paralytic contractures (Hennig); (7) Spasm of the glottis (Zavizianos); (8) Tonic spasms in the flexors of the extremities, with rolling spasms of the head, two days after the exanthem, accompanied by its disappearance (Pinkham); (9) Convulsions and eclampsia, usually with a similar effect upon the eruption, at different periods of the same (Posner, Adel de Roseville, Carroll, Kaufmann, Weil, Bartscher, Brachel, Fichtbauer, Bartels, Bierbaum, Troussean, Edwards, Liverani, Brown, Jutting, Espinouse); (10) Facial neuralgia (Imbert-Gourbeyre); (11) Intercostal neuralgia, with convulsions (Rilliet); (12) Neuralgic arthralgia OF THE leg with immobility of the knee, as an abnormal prodrome (Kostlin),; (13) and Strabismus immediately after the eruptive period (Baerbaum).

THE HEART.-

Heart disease is seldom observed in connection with measles, and that in spite of the weakening of the cardiac muscle which the febrile state occasions, from which latter indeed, a death now and then is recorded. Sturges ("Trans. Med. Chir. Soc.," vol LXXIV, 1891, p. 229), Lee (Ibid), Stephen Mackenzie (loc. cit, p, 429) and others insist that the few cases on record in no way prove that measles in itself can produce heart disease, and with this view the writer admits his agreement. Williams describes the finding of fatty degeneration, at an autopsy of cases in which the first sound had been toneless, or accompanied by a systolic murmur. Cases of endocarditis have been encountered by Cheadle ("Trans. Med.- Chir Soc., 1891 vol LXXIV, p. 229) Hutchinson (Ibid), Haig Brown (loc. cit) (with pericarditis) once only amongst 159 cases of measles, Hennig, Martineau, West, and Kohler; whilst amongst the older writers pericarditis has been reported by Berndt, Mayer, Espinouse, Braun, Siegel. Mettenheimer and Heyfelder.

THE KIDNEYS.-

Measles being a febrile disorder, the occasional finding of albuminuria is not surprising; but it seems to be much less common than in scarlet fever, and need occasion no alarm. The presence of propepetonuria has been reported by Loeb (Cited by Williams - loc. cit.) in nine out of twelve cases examined during the height of the disease or at the beginning of desquamation. Zichy- Woinarski (Australian Med. Gaz., Oct. 15, 1893) describes uraemia as a sequela of measles; and ascites and anasarca ha ve been reported even in cases where no renal abnormality could be detected (Zehender).

Nephritis is well known to be a rare complication of measles (Henoch) and Reimer's statement ("Casnistische und pathol-anat. Mittheil. aus dem Nicolai-Kinderhospital Zu St. Petersb.," "Jahr. f. Kinderh", Vol X, p. 3) that he found it in 5 out of 51 autopsies on children who had died during one attack of measles refers to an exceptionally frequent finding, as it is probable that the lesions in question were the result of chronic tuberculosis from which

the subjects were known to have suffered during life.

TUBERCULOSIS.-

Tuberculosis of the lymphatic glands (apart from a similar affection of the lungs) has been known to follow measles, and sometimes appears also at the height of the exanthem, in the miliary form, the tubercles appearing especially in the lung and cerebral meninges. The disease at times immediately follows the exanthem and runs a fatal course in a few days or weeks, appearing under the form of an intense bronchitis and with cerebral symptoms after the style of acute hydrocephalus, but with hyperpyrexia and frequent pulse; the very sensitive skin in such cases being frequently the site of erythema. The development of tuberculosis after measles occurs either (1) by the draining of the inflamed portions of the bronchial mucous membrane, the lymph stream flowing through the corresponding lymph nodes, increasing in volume as in case of ordinary inflammatory processes, setting free some of the tubercle bacilli resident in the nodes, and so carrying them into the circulation; or (2) the tubercle bacilli may enter from without and implant themselves on the inflamed parts of the bronchial mucous membrane.

Tuberculosis after measles does not, however, at once necessarily prove fatal, as temporary improvements are frequently observed. It is likewise noteworthy that many measles epidemics produce a high death-rate amongst tuberculous children; and that many who in after life succumb to pulmonary phthisis in after life are known to have had their pulmonary lesion started from a broncho-pneumonia of measles, a malady leading to the tubercular condition with remarkable frequency.

PORPURA.

Should purpura supervene on measles it may do so without modifying the eruption; but, as a rule, the contrary happens with the production of the haemorrhagic form of the disease.

Constitutional Diseases.-

As sequelae of measles the following have been observed:- (1). intermittent fever (Meyer-Hoffmeister), (2) Acute rheumatism (Silzmaun); (3) Haemorrhagic diathesis (Trousseau) (4) Morbus maculosus Werlhofu (Maserei, Mettenheimer); (5) rickets (Mettenheimer); and (6) Scurvy. The latter is of a somewhat rare sequela; and has been seen in the buccal cavity, without giving rise to gangrene, and either with or without further symptoms of the haemorrhagic diathesis referred to.

PHLEBITIS.-

This constitutes a somewhat rare sequela of measles, a fatal case has been reported by Mackey (Brit. Med. Jour. Dec., 19, 1896, p. 1772) occurring in the Brighton Children's Hospital.

GANGRENE.-

Gangrene is apt to result in cases of measles in whom there is a strumous or rachitic taint. Steiner and Neureutter observed gangrene of the lungs with measles in two instances: both cases ended fatally. The condition usually begins in the form of an ulcer, the base of which from the first shows a discolouration, whether they proceed from a catarrhal and apparently simple affection, or from

an originally dangerous one, e.g. gangrenous bullae. They occur especially in the buccal cavity and on the genitals of boys and girls - noma. In the former case the ulcers originate from the gums, the lips, the mucous membrane of the cheeks, the cavity of a tooth, &c., and sometimes go on uninterruptedly in their course while they destroy very considerable portions of the skin of the face and of the base of the tongue, even of the muscular structures of the latter as far as its tip; or they may cause, short of that, a partial separation of the attachments of the tongue and consequent difficulty in swallowing (Bartels), or even partial exfoliation of the nasal bones (Huxham), and of the jaws (Huxham, Bartels, Sadler, Bresseler), or at least loss of the teeth. This noma arises for the most part only after the fading of the rash, and, therefore, does not influence its course;, it, however, generally occasions more or less violent fever with its consequences, loss of appetite, diarrhoea, and respiratory disturbances. Death does not always occur; where the course is relatively mild, the patients can recover with disfiguring loss of tissue. Thus, Bentley has described a case where so great a stenosis of the mouth followed that only one finger could be introduced, and then only with difficulty. Noma of the genitals appears to be more common with girls than with boys, in whom it may begin at the prepuce and progress as far as the naval (Bartels). Gangrene of the vulva is developed in the same way as that of the buccal cavity, and can destroy the labia, the vaginal orifice, the mons veneris, and even the perinaeum as far as the anus: the secondary results are the same as before.

Gangrene may also occur after measles upon other ulcerating or eczematous portions of the skin, especially on the nasal alae and the external ear (Causit, Mayr, Triboulet) Faye has recorded a case in which gangrene spread from the finger upon the forearm; Mayr mentions gangrene of the forearm in Caries of the radius; Battersey a similar instance, and also a case of gangrene of the lower lip; Faye, another in which some pustules which had arisen during the eruption produced gangrene and extensive destruction of tissue upon the loins; Thomas (of Paris) describes the case of a child of two years, on whose nates extensive gangrene was developed. Carroll mentions a severe epidemic of measles at Sydney in which there occurred several cases of great malignancy, where on the face and thorax only a few dark blotches appeared, while upon the extremities single vesicles were formed, which rapidly increased to a large size, first, and became gangrenous: the affection extended with such rapidity that sometimes within twenty-four hours the whole epidermis would be lost. Maserei observed upon the soles of the feet and palms of the hands, during the desquamation, large bullae, which burst leaving obstinate, painful ulcers. In very rare instances gangrene of the lungs has been reported, and only as a sequela of bronchopneumonia.

Measles in Relation to Other Diseases.-

Measles has been known to co-exist with other diseases, and exerts varying influences upon the primary disturbances. When the latter belong to the common complications of measles, they are usually made worse by the onset of the disease. Thus, should the malady appear in the course of, or during the convalescence from a pneumonia, this becomes worse or reappears, and in all cases recovery is delayed; so too, a bronchitis is likely to become aggravated to a capillary bronchitis and bronchopneumonia. Phthisis is speedily made worse, and destroys the patient sooner than otherwise. Walz lost by suffocation a girl of five years suffering from aneurism of the aorta. Children with

chronic diarrhoea are usually made worse with measles, and in general a previous gastro-intestinal catarrh predisposes remarkably to the diarrhoea of measles, more especially in teething children (Walz). Children suffering from measles are very apt to be attacked with Cholera, and usually in a marked degree (Polak, Mayr, Weisse). The predisposition to diptheritic and gangrenous affections, exerted by measles, has already been referred to. Should measles on the other hand appear during a disease to which it does not usually give rise, it may favourably influence the course of the latter. Thus, it has been observed when attacking a patient with psoriasis, eczema or other chronic diseases of the skin, to cause it to disappear for a time and to return, as a rule after the disappearance of the exanthem. Behrend, however, has described the case of a woman of forty years, whose eczema of the scalp of three years' duration disappeared permanently after measles. Barthez and Rilliet mention that Chorea, Epilepsy, and incontinence ofurine of several months' duration were cured by measles; and also an anasarca after scarlatina disappeared coincidently with the eruption of measles. Weisse reports that measles, in the case of a girl suffering from convulsions, lead to a permanent cure of that disease; Mettenheimer, that a boy suffering from nervous winking of both eyes was relieved of this affliction during the morbillous attack, though, after several weeks, it by degrees returned; and in another instance the cure of nervous cough of three months' duration. Quersent has reported, with the beginning of the prodromal stage of measles, permanent relief from epileptiform attacks, which had appeared in consequence of a fit of anger, and of which the patient had had several daily for many years. Schmidt describes the case of a girl of six years (who had for a year suffered from frequent daily convulsive attacks, which had so reduced her strength that death was expected) who recovered entirely owing to measles; he also saw a boy of five years, with a contracture of the lower extremities lasting for six months, in whom this disappeared, as if magically, with an attack of measles. Feith and Schroder van der Kolk report the case of a woman who for five years had been in a lunatic asylum with violent attacks of mania, which did not return after recovery from measles, so that the woman came to be discharged as cured. Mombert and Michele describe the passing of lumbricoid worms, in consequence of measles, as a frequent occurrence. Hildebrand observed an obstinate disease of the joints, which resisted treatment for three years, heal up entirely after measles, of itself, in a very short time; so also the dispersal of chronic glandular tumours in the same way. Mettenheimer reports a caries of the tibia which had undergone a remarkable improvement immediately after measles; and Roser, a caries of the hand of a years' duration, in the case of a boy of three, heal quickly after measles. Levy states that an old gonorrhoea of the penis disappeared with the outbreak of the exanthem of measles, which was immediately followed by chicken-pox; after the expiration of this the gonorrhoea at once returned; in another case after measles it did not return. Pank has seen an obstinate ophthalmia disappear for a short time under the influence of measles. Measles and scarlatina have been reported as occurring together by Johnston (Brit. Med. Jour, Dec 31. 1898, p. 1928) and others. The concurrence of the two diseases will greatly aggravate the prognosis: thus, Hase lost eight of ten such patients.

The occurrence of Chicken-pox during the course of measles has been noted by Joshua (Lancet, July 13, 1889), but does not appear to have unfavourably influenced the prognosis. The concurrence of measles and whooping-cough has been frequently observed: Bernady (Annals of Gyn. and

Ped., July, 1894) observed it 21 times in 166 cases. The two diseases seem to exert a mutual predisposition. There are some, however, who regard the paroxysmal cough, so frequently seen during measles, as being due to the pressure of enlarged mediastinal glands; and from the resemblance of the symptoms Mussy contends that the essential cause of whooping cough can be attributed t o a specific tracheo-bronchial glandular hyperplasia. Subcutaneous emphysema in the absence of known injury or severe cough - has been reported as a complication of measles by Palleske (Deut. Med. Woch., 1898, vol XXIV, p. 255), Kelly (Therap. Gaz., Jan., 1891), and Felsenthal (Arch. f. Kinderh., B. 14, H,I & 2, 1891). The relationship of tuberculosis to measles has already been referred to.

D I A G N O S I S.

A General Diagnosis:-

In epidemics chacterised by irregular forms of the disease the diagnosis of sporadic cases may be very difficult, but usually due observance of the relative importance of the various symptoms that have been already detailed will suffice for the recognition of measles in nearly every instance. Owing to the early infectivity of the disease it is of urgent importance that it be diagnosed during the prodromal stage. Observance of a feverish period of four days, associated with catarrhal symptoms of the eyes, nose, and upper air passages, a few papules on the hard palate followed within 24 hours by a papular efflorescence on the face will, in addition, usually discriminate measles from nearly every other disease with which it is at times confounded. It must always be borne in mind that the diagnosis of all the exanthemata should never be made on the rash alone, and indeed not on any one or two symptoms, as there is a great variation in the development of these diseases, as regards incubation, prodromata, and general symptomatology, and in doubtful cases a conclusion can only be arrived at by carefully weighing the symptoms as a whole, and noticing accurately how the supposed exanthem differs from the usual type, remembering that the more fully the rash is developed the less likely are the other criteria to fail in a real exanthematous fever.

Meunier's Sign.-

According to Meunier ("Sur une symptome nouveau de la periode precontagieuse de la rougeole et sur sa valeur prophy lactique", Paz. Hebd. de Med. et de Chir., n.s. T.iii, No. 89, 1057, 1898), there exists during the incubation stage of measles a phenomenon consisting in a marked lowering of body - weight independent of any kind of morbid trouble whatever; and this loss, or pre-measles fall of weight, is all the more important and suggestive as it contrasts in the child with the ascending curve of physiologic growth. It has been observed to commence about the fourth or fifth day after infection,- that is five or six days before the appearance of the first catarrhal or febrile symptoms, eight or ten days before the exanthem,- lasts several days, even to the beginning of the stage of invasion, in intensity varies; and is independent of the age of the patient as well as the severity of the subsequent symptoms. Meunier states that the loss of weight varies from 1½ to 10 ounces in a child of 1 to 4 years of age, but that it has been observed as great as 22 ounces , usually never less than 3 ounces.

Odour of Measles.-

Little weight can be attached to this: it has been compared to that of freshly plucked feathers.

Condition of the Blood.-

This has received attention in a preceding chapter.

Koplik's Sign.-

Of special import as regards diagnosis, and in addition and confirming what has already been remarked with reference to Koplik's spots, may here be added that: (1) Cases of measles nearly always show buccal spots, usually

early enough to be of corroborative diagnostic value, that is in about 91 per cent of all cases. (2) Typical Koplik spots are seen in measles only. (3) The presence of buccal spots without other symptoms of measles cannot be considered a guarantee of immunity against the infection of measles. (4) The average time of appearance of buccal spots before the exanthem is one to three days: a few cases have been reported as early as the fifth day. (5) Buccal spots lead to an early diagnosis, but unfortunately the diagnosis is, even then, not early enough to antedate infection in this extremely contagious disease: it does not suffice to prevent the spread of measles in the schools, hospital wards, and asylums. (6) Buccal spots serve in differentiating measles from: (a) Scarlet fever, in which the buccal mucous membrane is of the normal colour. (b) Simple aphthæ, which does not show such bright red spots and the bluish-white specks characteristic of measles spots. (c). German measles, a pronounced case of which is often extremely difficult to differentiate from measles. The buccal spots here serve a useful purpose. In measles about 91% show buccal spots. In German measles the mucous membrane is normally pale pink, and never shows Koplik's spots. (d) Antitoxin rashes, erythema multiforme, common cold, influenza, and so forth. (7) To conclude, the presence of Koplik's spots helps in a large majority of cases; and the consensus of medical opinion seems to be that, while their absence does not exclude measles, their presence is pathognomonic of measles.

B. Differential Diagnosis.

1. INFLUENZA.-

Influenza being accompanied by symptoms of a "cold" frequently is mistaken for early measles more especially if there be pyrexia and prostration. The most important differential sign, however, is that of photophobia in the prodromal stage of measles; so that were a child-previously unaffected by measles - observed to be suddenly seized with "cold" accompanied by dread of light, the diagnosis of measles might safely be made, even in presence of an epidemic of measles: the development of the exanthem on the second day or first and its other classic symptoms would confirm the suspicion. In addition to this it may be noted that vomiting is rare in influenza and common during the prodromal stage of measles.

2. Scarlatina.-

Scarlet fever is but seldom mistaken for measles; but occasionally one finds, at the outset in both diseases, loss of appetite, vomiting, drowsiness or irritability, and a rapid rise of temperature. Attention to the following points will however help to clear up the difficulty. The attack of scarlet fever is usually ushered in with vomiting, the rash appears within a few hours of invasion, attended with marked inflammation of the fauces, tenderness and enlargement of the submandibular glands, and much discomfort in swallowing; while the tongue, even if it does not present the characteristic strawberry appearance, nearly always shows signs of peeling. The temperature declines gradually with the rash, instead of falling suddenly within about 24 hours after its full development. The eruption appears on the face in the form of a simple vivid flush, the skin around the mouth remaining pale and free from it. The cutaneous lesion is never macular on the palms of the hand or soles of the feet, being merely erythematous. The individual papules of the eruption are smaller and more closely aggregated, and though the papules are in part well developed, the surface of the skin is nearly always flushed. As the erythema subsides, a uniform staining of a greenish yellow tint remains without any suggestion of mottling. The subsequent peeling is usual-

ly more pronounced and presents the "pin-hole" characters peculiar to scarlet fever. Definite nasal catarrh is absent, while the supervention of either rheumatism, adenitis, or albuminuria, is confirmatory of scarlet fever.

3. German Measles.-

Rubella, or German measles, may be distinguished from measles by its less severe onset and course, by the absence of coryza, severe bronchitis, and Koplik's spots; by the lighter colour and more diffuse character of its rash, and the irregular shape which the patches assume. The presence or absence of an epidemic is an important factor in the diagnosis, and in cases occurring when there is no epidemic the diagnosis between this disease and measles of a mild type is difficult if not altogether impossible.

4.Roseola, Erythema, nettle-rash, and prickly heat.-

These maladies, which are frequently seen in children suffering from digestive troubles, can usually be distinguished by the absence of the catarrhal symptoms of measles and of constitutional disturbance. The temperature, moreover remains normal, or undergoes merely a brief elevation. The eruption seen in these diseases never appearing in the order characteristic of measles. Thus, Erythema appears usually on the backs of the hands, forearms, and feet; whilst simple roseola is apt either to be limited to the face, or extends to the neck and chest, rarely over the whole body, and is likewise of a most evanescent character. The cutaneous lesions of erythema are usually larger, sometimes forming more or less extensive plaques, while roseola simulates more closely the deep blush of scarlatina. The rashes due to excessive perspiration and the irritation produced by flannel or other rough clothing are easily distinguished by the absence of coryza and constitutional symptoms.

Epidemic measles eruptions commonly encountered in the tropics and elsewhere (e.g. Dengue and Malta fever) are sufficiently characterized by their peculiar symptoms. Roseolous eruptions produced by decaying straw are described by Salisbury as resembling measles very closely, but should occasion no difficulty in recognition.

5. Serum Eruptions.-

The rash of measles is sometimes simulated by the rashes which follow the injection of antitoxin serum in diphtheria and antistreptococcic serum; but here the constitutional symptoms are usually so dissimilar that the mere knowledge that such efflorescences sometimes follow the use of these substances should be sufficient to ensure safety from a diagnostic standpoint.

6. Acute General Eczema.-

This disease, which has been known to spread in an epidemic fashion, occasionally is mistaken for the rash of measles, the more so if it be accompanied by ophthalmia, which often happens. The dissimilarity as regards constitutional and other symptoms, and the fact that the eruption is attended by scabbing and crusting from an early date, will readily differentiate it from rubeola.

7. Variola.-

The macular stage of small-pox has been known to have been confounded with measles; but the absence of the characteristic prodromata and symptoms of invasion belonging to the latter disease, the redness and swelling of the conjunctiva, the photophobia and marked coryza, the stubborn

cough, and increased fever after the eruption appears, make the separation, as a rule, easy; the more so, indeed, should the macular develop into hard, shotty, conical papules which entirely negative rubeola.

8. Typhus.-

Should measles and typhus be coincidently prevalent in epidemic form, the two diseases may be confounded. In typhus, too, the eruption is not infrequently papular and even haemorrhagic like unto that of measles, and a catarrhal affection of the air-passages, especially of the trachea, is (according to Pastnau one of its usual concomitant symptoms) In two of the cases of typhus in children, reported by Rantenberg, the papular roseola was so thick that one could hardly help confounding it with measles. As a rule, however, apart from the fact that the fever and the course of the ~~fever~~ disease are different, the deciding symptoms against measles are the absence of, or sparse, eruption upon the face; the absence of catarrh of the nose and conjunctiva; and, lastly, the marked swelling of the spleen. According to Naunym, children with typhus may be attacked by nasal catarrh, conjunctivitis, and cough, and an exanthem perfectly resembling measles may appear for three days; whilst Kierski states that he has observed affection of the mucous membranes at the end of the first week of the fever. The eruption. moreover, of malignant measles may bear a very close resemblance to that of typhus; but, here again, it is important to note that the rash in typhus appears first upon the trunk; the exanthem of measles upon the face; Koplik's spots do not appear in typhus; and general points with reference to epidemicity of the respective maladies.

9. Varicella.-

Measles with large miliary vesicles may create a suspicion of chicken-pox, and the latter, if the single vesicles are unusually small, and interspersed with profuse well-developed roseolae, may be mistaken for measles; but the general history and features of the case will clear up the doubt in due course.

10. Typhoid Fever & Cholera.-

The symptomatic roseola of these and other diseases may be mistaken for the exanthem of measles; but a day or two of careful observance and study of the case will make them well defined.

11. Drug Eruptions.-

The rashes produced by certain drugs given for influenza and"colds" may be mistaken for that of measles; but, here again, the history of the case decides.
(a) Quinine. The eruption produced by the administration of this remedy is apt to be particularly confusing, as it is often given during the prodromal stage of measles. Reporting upon 60 cases of Quinine eruption, Morrow ("Drug Eruptions", New York, 1887) states that 38 were erythematous. The mere fact of the possibility of this should guard against such cutaneous lesion being mistaken for the exanthem of measles; but if doubt exist, the discontinuance of the drug will lead to its disappearance. The rash, moreover, usually appears upon the trunk and extremities, as well as upon the palms and soles.
(b). Antipyrine.- Ernst (Centralbl. f. Klin. Med., 1884, No. 33) was the first to point out the close resemblance between the eruption of antipyrine and that of measles, and reports five cases of the condition. As in the case of that of Quinine, the eruption partakes of the erythematous form,

appearing upon the face, chest, abdomen and back, rarely on the face and neck, and only very exceptionally on the extremities. The absence, however, of the exanthem on the face and neck, the freedom from catarrhal symptoms and buccal enanthem of rubeola will overcome the difficulty of recognition.

(c). Chloral.- A skin eruption has been sometimes observed to follow the administration of chloral, and consists of a diffuse erythema which first appears upon the face, to become disseminated over the neck, chest and extremities, more especially over the joints of the knee, wrist, elbow and ankle, with the additional peculiarity that on the face it usually manifests itself as a diffused redness, while on other parts of the body it is made up of dusky red spots or patches of various sizes, and irregular outline, giving to the skin a mottled appearance. According to Morrow ("Drug Eruptions", New York, 1887) it becomes more pronounced after meals and the imbibition of alcohol, and sometimes too after the discontinuance of the drug producing it. These characteristics and the absence of the classic symptoms of measles should serve to readily distinguish it.

(d) Cubebs and Copaiba.- In cases where balsamic preparations of Cubebs and Copaiba are given for gonorrhoea and urethritis the rash so produced may be mistaken for that of measles, especially should there be an epidemic about. The odour of the patients'breath, and careful observance of the clinical course, should, however, help to confirm the diagnosis without difficulty. The following discriminating points should also be borne in mind in dealing with such cases: (1) Copaiba and Cubebs eruptions appear in the form of bright red spots, about the size of a sixpence or smaller, the macular elements being separated by normal skin, but occasionally coalescing to form irregular patches of a considerable size. (2) The spots disappear on pressure, the same as in measles, but they are , nevertheless, not elevated above the surrounding skin as in the latter disease. (3) The lesions exhibit a marked tendency to appear around the joints of the extremities, in this respect, therefore , presenting an important difference from the exanthem of measles. (4) In very exceptional instances the spots appear upon the face - a point to be particularly noted in case of mistake. (5) Finally, the mucous membranes remain unaffected.

12. Bites of Insects.-

In children and others, possessing delicate and sensitive skins, an eruption, closely resembling that of measles, may be produced by the bites of bugs, mosquitoes and fleas. The absence however, of constitutional disturbance precludes the possibility of their continuing to be mistaken for rubeola.

13. Syphilis.-

The fact of syphilis possessing an early mottled, blotchy or macular eruption, and a lesion of the mucous membranes sometimes allows of the condition being mistaken for measles. This should, however, not occur, remembering: (1). Syphilis is a disease usually of adults, and measles a disease of childhood. (2) The chancre of syphilis is nearly always in evidence during the early stage. (3) The morbillous fever, catarrh, and severe constitutional symptoms are absent in syphilis.

14. Stomatitis.-

The frequent association of anorexia, bodily discomfort and irritability, with aphthous stomatitis has led to the latter being mistaken for the enanthem of measles.

The aphthous spots are, however, of a wash-leather appearance, larger, and speedily ulcerate.

15. Measles without Eruption.-

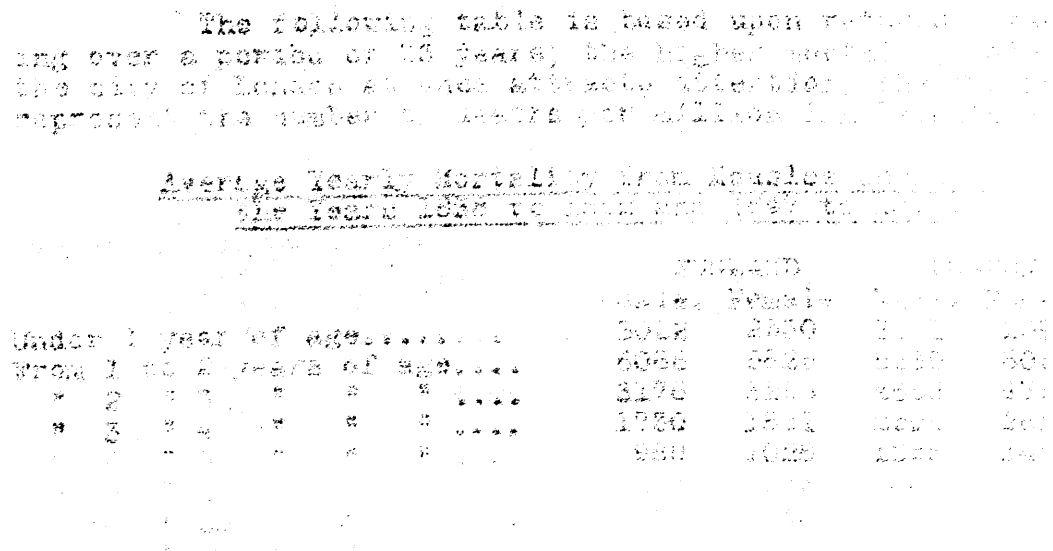
In the absence of an epidemic or typical cases, this variety of the disease might escape attention; and the diagnosis of measles of this kind can only be made with certainty at the time of an epidemic or when infection can be traced to another case; failing which the prodromal symptoms and the condition of the mucous membranes, the presence of Koplik's spots and a possible abortive rash about the face and neck should suffice to establish a diagnosis in every instance.

16. Septic Infections.-

Pyogenic microorganisms have been known to produce an eruption bearing a great resemblance to the exanthem of measles, but due consideration of the other symptoms, and the history of the case, should leave no doubt as to the real nature of the sickness.

17. Measles in Dark-skinned and Coloured Races.-

The dark complexioned races present especial difficulty for the diagnosis of measles in whom the exanthem appears in the form of irregularly indented, coppery blotches, and occasions a marbled appearance; while that of negroes is distinguished by minute vesicles, like lichen papules or miliary vesicles, or by papules appreciable to the touch, which last fact, together with occurrence of lesions on the mucous membranes, the cutaneous desquamation, and the general constitutional disturbances must be relied upon in arriving at a conclusion as to the real nature of the disease (Pruner, Maugler, Rigler, Roux).



PROGNOSIS.

As a rule the prognosis of typical and uncomplicated measles is thoroughly favourable; and in general it may be said that epidemics of measles are of a much less malignant character than those of scarlet fever or smallpox, and that the course of an individual case of measles will depend in part upon the nature of the epidemic, and in part upon the power of resistance displayed by the affected person. In spite, however, of its usual benignity the disease may become of a virulent and pestilential character under conditions such as existed in Iceland and the Faroe Islands.

Conditions justifying a Favourable Prognosis.-

The fever should be moderate, except during evening exacerbations; the pulse should not exceed 120 beats in the minute, and the temperature being below 100°F.: moreover, both temperature and pulse should begin to fall as soon as the rash is fully out, and should afterwards decline steadily. The skin ought to be moist; there should be no disproportion between the amount of fever and the degree of muscular debility; the breathing, even if quickened, should yet be deep; the cough should be slight and loose, and should subside as soon as the rash disappears. This, again, should be of the usual colour and of normal duration. Lastly the patient should be young.

Conditions to be interpreted Unfavourably.-

Great weakness or excitement with the onset of the fever; the skin dry and hot; the pulse hard and very rapid; the respirations laboured, more quickened and attended with short cough; the sudden fading of the rash, its change of colour, or extraordinary long duration; profuse epistaxis; croup; intense bronchitis or tracheitis - especially in rachitic children; pneumonia; purpura and scurvy; gangrene; tuberculosis; an d other complications and sequels as already noted.

Effect of Measles upon the General Death-rate.-

The following table is based upon returns extending over a period of 33 years; the higher mortality rate of the city of London at once attracts attention; the figures represent the number of deaths per million inhabitants:-

Average Yearly Mortality from Measles During the Years 1838 to 1842 and 1847 to 1874.

	ENGLAND		LONDON	
	Male.	Female.	Male.	Female.
Under 1 year of age.....	3022	2530	3571	2897
From 1 to 2 years of age....	6086	5825	8630	8050
" 2 " 3 " " "	3178	3255	4683	4757
" 3 " 4 " " "	1730	1851	2594	2620
" 4 " 5 " " "	980	1028	1358	1446
" 5 " 10 " " "	255	278	301	316
" 10 " 20 " " "	29	38	24	32
" 35 " 40 " " "	3	5	2	3

The average mortality per million for one year was

ENGLAND.		LONDON.	
Male.	Female.	Male.	Female.
457	422	620	522

That the mortality rate from measles has steadily declined with improvements in sanitation, and the like is universally admitted, and is evident from the Local Government Board's returns from which the following figures are extracted:-

Year	1851-60.	1861-70.	1871-80.	1881-90.
Annual Mortality per one thousand per-sons living at ages under five years	2.8	3·0	2·57	3·13

That under favourable conditions the mortality of measles is, as a rule, comparatively slight is apparent even from the returns of former years, when too, it was, as now, regarded as amongst the least fatal of the infectious diseases Thus, according to Faber, there died in the epidemic of 1827-28, at Schorndorf only 1·8 per cent of 2,100 cases; according to Geissler. from 1835 to 1869, Meerane, only 2·1 per cent of all the deaths amongst children were from measles, the severe epidemic of 1861 causing only a mortality of 3·5 per cent; according to Ranke, in four epidemics at Munich, the mortality varied from 0·7 to 2·7 per cent.; in the childrens Clinic at Wurzburg, there died, according to Voit, out of 851 cases of measles, from 1862-71, 39; or 4·5 per cent; in Stuttgart, according to Kostlin (1852-65),1·8 per cent.; the epidemic at Frankfort (1858) occasioned, according to Kostlin, a mortality of 2.4 per cent. Occasionally an epidemic is marked by special malignancy, owing to the occurrence of severe complications, which markedly increase the number of fatal cases. Thus, there died at the Children's Hospital in Wurzburg, in the epidemic of 1863, 10.5 per cent.; in the Grand Duchy of Baden, according to Neier, from 1818-24, 5.4 per cent.; in an epidemic at Sydney, according to Carroll, 6 per cent.; at Leith according to Brown, 9.7 per cent,; in the district of Zolkien (1840), according to Seidl, out of 1,519 cases, 196, that is, almost 13 per cent.; at Nagold, according to Schuz, nearly 10 per cent.; at Altdorf, according to Kapff, 10 out of 95 cases; at Herrenberg, according to Fricker 1 out of 11; according to other reports from Wurtemberg, in the years 1836-37, out of 317 cases, 47; out of 312, 22; out of 266, 24, and so on. Under the influence of specially harmful agencies, similar, or still more unfavourable porportionate ratios are exceptionally encountered. Thus, there died on the River Amazon 1749-50, according to d'Alves, 30,000 Indians; a similar mortality occurred in British North America, according to Meyer-Ahrens; at Madagascar, 51000 cases died in one month in 1806; in the American Army, according to Woodward, out of 21,676 cases of measles, over 2.5 per cent died, merely from the fever, without reckoning the numerous complications; the mortality it has been already noted, assumed alarming proportions during the famous epidemic at the Faroe Islands; also, according to Meyer-Ahrens, during that of Iceland (1846). There succumbed upon an Indian emigrant ship, according to Roux, out of 43 cases of measles, 11; in the restricted accommodations of the Stockholm Children's Hospital, of 131 cases, 36 per cent died; under favourable hospital conditions, according to Laverau, 40 died out of 125 soldiers who had contracted measles, but who were at the same time worn out by the campaign.

Mortality according to Epidemic.-

The cause for the extremely malignant nature of certain epidemics of the past has been sought for in vain, and theories vaunted in former times which are now-a-days utterly untenable, such as climatic influences, geographical position, "virgin-soil" hypothesis, and the like. Even the unsuitable and dietetic and theropeutic procedures of the past - already noted - do not quite explain the differences of mortality reported by one and the same observer during different epidemics, or from the same district at different times. Universally applicable rules cannot as yet be laid down, and even the rare exceptions - about to be noted - of malignant epidemics must be left to the future to explain.

To quote a few examples - at Lippe, in Hungary, an epidemic prevailed, in 1856, of such a malignant character throughout that over 50 per cent of the cases died, mostly after a normal prodromal stage, through complications which occurred after the fifth day, while in 1863 only 3 per cent died. The epidemic at Winschoten, beginning in May. 1865, occasioned - according to Mesling - a mortality of 4.83 per cent, while that of the middle of September, 1871, caused only one of 2.1 per cent. According to Karajan, the mortality of the epidemics of 1862, in lower Austria, which occurred during the presumably unfavourable cool months, reached only 2.29 per cent. while that which occurred in the summer months of 1863, in the same district, attained to 6.29 per cent. If, from this, summer epidemics should appear more fatal, yet in other places precisely the reverse has been the case. Thus, according to Voit, there died in the Children's Clinic at Wurzburg, within thirty years, during the ~~summer~~ months, 12.7 per cent of the measles cases; in spring 11.5 per cent.; in summer, only 2,5 per cent,;in autumn 0.4 per cent. According to Passon, however, of all the fatal cases of measles in Berlin, from 1863 to 1867, there took place in winter41.4 per cent.; in spring 11.9 per cent.; in summer 13.3 per cent.; in autumn 33.4 per cent.; the autumn being, therefore, essentially more unfavourable than in Wurzburg. In 1885, in Sunderland, County Durham, an epidemic of great severity broke out, which, according to Harris (Lancet, April 30, 1887, p. 970), was the most malignant ever experienced, in that out of 1316 cases, 384 deaths occurred, that is over 29 per cent.; during the decade immediately preceding, the average number of deaths annually from measles had been 46, the same being regarded as low. In 1887, an unusually malignant epidemic broke out in Liverpool and district, the mortality being 15 per cent.; in contrast to which was the 1875 Canary Islands Epidemic with only 8 deaths amongst 1123 cases. The extreme virulence of epidemics of measles amongst savages has been referred to, the disease at one time amongst the North American Indians working havoc everywhere: the cause of this is usually put down to atmospheric inclemencies. The 30 per cent. mortality of measles, on its introduction to the Fiji Islands in 1874, is quoted in favour of the"virgin-soil" hypothesis. The epidemiology of Iceland, moreover, furnishes a striking illustration of the ravages of measles, when its susceptibility as a whole has not been lessened by frequent outbreaks of the disease. According to Hagenbach ("Epidemiologisches aus Basel," "Jahrbuch f. Kinderh." n.s., vol IX, p. 57), pandemics occurred there in 1664, 1694 and 1846; in 1868-69, however, the outbreak was confined to a small part of the island. On the 23rd of May, 1882, the infection was carried there from Copenhagen, and swept over the whole island, lasting until September of that year; and, as no effort was made to prevent its spread, the destruction it is capable of working can be imagined. Thus, the total death-rate from all causes for 1882 was 3259, whereas in the four preceding years it

had varied between 1500 and 1800. The number of deaths in 1882 exceeded the births by almost 1000; and so great was the commercial effect of the epidemic that important industries were brought to a standstill for weeks together. The disease did not even spare infants under six months - as is usual,- and was particularly fatal to pregnant and puerperal women. In the six medical districts, with populations of about 5,500 each, the total mortality from all causes for the year, was 408 (about 7.5 per cent); the total mortality from measles 250 (about 4.5 per cent,), of which latter 12 were still-births, 47 were less than one month of age, 68 between 1 and 12 months, and 16 were women who had lately been confined. So serious indeed was the state of affairs, that the medical officers seriously considered the advisability of making measles an epidemic disease in order to save thecountry in future from such pandemics. The malignancy in question, moreover, could not have been due - as has been suggested - to the cold of the northern climate when the epidemic of the (hot) Fiji Islands,- occasioned by the infection from Sydney,- which destroyed about one-fourth of the populace-m is taken into consideration.

The severity of epidemics of measles, however, does not vary nearly so much as in the case of scarlet-fever. Undoubtedly the carelessness of many mothers in allowing the disease to run its course untreated, and the general view taken as to its supposed benignity, are responsible in great part for its high mortality. Thus, according to Ranke ("Epidem. Skizzen aus Munchen," "Jahrb. f. Kineterh" n.s. vol. ii, 1869, p. 36), the average mortality at Munich for four epidemics was 1.7 per cent.; the separate epidemics 0.7 per cent., twice 1.5 per cent, and once 2.7 per cent.; total number of cases 1907. At Stuttgart, according to Kostlin (Arch. des Vereins f.Wissensch. Heilk., 1866, vol. ii p. 342), from 1852 to 1865, 380 cases of measles were treated by the medical officers of the city charities, in which the facilities for recovery were unfavourable. In spite of this. latter, however, only 7 died, the death-rate, therefore, being the extremely low one of 1.8 per cent. The epidemics atthe following four places may be taken as representing those of medium severity. Thus, at Heidelberg, according to Embden (loc. cit. p. 4), in 1888, there were 461 cases of measles, at the Policlinic and the Children's Hospital, with 31 deaths, or 6.7 per cent. At the Policlinic of Kiel, in 1860, according to Bartels (loc. cit. p. 66), 573 cases with 21 deaths, or 6.8 per cent. At Griefswald, in 1861, according to Krabler (loc. cit. p. 119), 311 cases, with 21 deaths, or 6.8 per cent. At Wurzburg, in 1883, according to Brier (loc. cit. p. 11), 1896 cases with 153 deaths.

The variation in the mortality of measles at different places was long ago pointed out by Schiefferdecker (Einfl. d. acut. Hant. auf d. Kdrstrbl., 1870), who stated that in London out of 1,000 deaths, according to statistics extending over eleven years. 27.0 deaths were due to measles; in Frankfort-on-the-Main, - during 12 years, - 12.0; in Konigsberg, - 12 years, - 9.2; in Geneva Canton, - 13 years - 6.6; in Stuttgart, - 15 years, - 6.3; in Munich, - 7 years - 5.8; in Berlin, - 18 years, - 3.8 cases. Probably in some places the difference in mortality may depend partly upon the presence or absence of severe epidemics of measles during the years concerned, but this cause, nevertheless, fails to explain the very noticable difference between the two great cities, London and Berlin, in which it may be presumed that measles is more or less endemic, and the cause must,therefore, be sought in local conditions, which either increase the mortality from measles in London, or that from other causes at Berlin: the former is probably the most important cause of the marked difference. According to Whitelegge ("Change of Type in Epidemic Disease", Milroy Lectures, Brit. Med. Jour., 1893, Vol. T., p. 451) the interval between epidemics is generally about two years, some-

times six months more or six months less, - and due (1) to the seasonal curve showing two maxima, and (2) an epidemic wave of longer period, recurring at intervals of ten years, when a very high mortality is reached; or (3) the fact that in populous places a series of epidemics may gradually raise the mortality of measles to a rate double or treble that of the ordinary seasonal maxima. The highest mortality of measles is universally admitted to be found in cities, asylums and nurseries; and, according to Williams (loc. cit), the disease seems to be quite unaffected by improvements in sanitation; in proof of this may be taken the Local Government Board's reports for England and Wales (Thompson - "Twenty-fourth Annual Report of the Local Government Board, with Supplement; v. 1894-95), showing an increasing mortality since the decade ending 1880, while the principal zymotic diseases which were more directly dependent on sanitation decreased.

The mortality amongst cases treated in private practice seems to be considerably less than that observed at the hospitals, owing perhaps to the greater vital resistance of the former, and their presenting themselves for treatment sooner. Thus, according to Furbringer (Berl. Klin. Woch., 1891, S 103), the death-rate in cases treated at the Policlinic was 6.7 per cent.; while among those treated in private practice it was only 2.6 per cent. In the Nursery and Child's Hospital of New York City, according to Adriance (loc. cit.) the number of cases of measles observed was 96, with a mortality of slightly over 15 per cent., whilst others in private practice have been known to boast of never having had a patient die from measles; which strikingly contrasts with experience in many public institutions. Thus, to quote further examples, Henoch (Berl. Klin. Woch., 1891, p. 103) mentions that of the 294 cases of measles treated in the Charité Hospital from April 1888 and October 1st., 1890, 89 died, or 30.3 per cent. Furbringer (loc. cit.) again, reports that, at Friedrichshain, from 1886 to 1890 there were 453 cases with 103 deaths, or 22.6 per cent.; and that from 1886 to 1887, the number of cases there being 181 with 55 deaths, the mortality was a s great as 30.4 per cent. Both Henoch and Furbringer, however, explain that almost all who succumbed were in a miserable condition, and were either rachitic, tuberculous or suffering from various atrophic conditions, or severe complications, when brought to the hospital. On the other hand, cases treated properly at home do not show such an alarming mortality even in the cities; and the prognosis in all cases in the country is, as a rule favourable.

A G E.

The prognosis in a case of measles will largely depend upon the patient's age, which, under all conditions, exerts the greatest influence upon the mortality of measles. Putting aside altogether the fact that healthy and very young infants,- up to the age of six months,- are attacked very mildly, if at all, these remarks may be premised with the statement that (1) measles becomes most dangerous only for young, or very young, children; (2) that its danger decreases very rapidly as years roll on, and in the late years of childhood is already at a minimum; (3) and, finally, that in old persons, who, however, are rarely attacked owing to their comparative lack of susceptibility, the disease is again dangerous.

Thus, Schuz states that he noticed a high mortality amongst children from six to eight years. In the Varis Garrison - ages 18 to 30 - deaths from measles were very frequent in 1838, 1839, 1848, 1849, 1855, 1860, due, according to Laveran, to the influence of vitiated hospital air.

So also, according to Schiefferdecker, there died from measles in London, from 1856-66: in the first year of life 3,368; in the second , 7,606; in the third, 4,261; in the fourth, 2,247; in the fifth, 1,184; from 0 to 5 years, 18,666; from 5 to 10 years, 1,076; from 10 to 15 years, 84; above 15 years, 111; total, 19,937. Likewise at Konigsberg in six years: in the first year of life, 88; in the second and third. 157; from the fourth to the tenth, 115; from the tenth to the twentieth, 2; of older persons, none at all. According to Passon, the absolute mortality from measles in Berlin, in 1863-67, increased after the second year of life, at which point it reached its greatest height: 24 per cent of all the deaths were in the first year, 31 per cent in the second year. From the third year onwards it diminished, at first rapidly, then slowly, up to the thirtieth year, not constantly, however, since in the eighth and tenth years there was a slight increase, while from the twentieth to the twenty-fifth year no deaths took place. From the thirtieth to the thirty-fifth year the mortality again increased slightly; above thirty-five years there died only one person, aged 62. According to Ranke, there died in Munich (1859-68) 70 children under one year (out of, 195), 119 at the age of from one to five years, 11 persons above fifteen years (out of 185 ill); the mortality of the first five years was, therefore, 24.5 per cent. In Wurzburg it was, according to Voit (1842-71), for the same years of life about 23 per cent.; there died of 88 patients under one year, 21, or 23.8 per cent.; of 367 from one to five years, 15, or 4 per cent.; of 289 from five to fifteen years, 3, or 1 per cent. In The Vienna Children's Hospital there died, according to Monti, 1864-67, of 372 cases of measles the enormous number of 98, of which 6 (out of 16 patients) were between six months and and one year old; 70 from one to five years (out of 173 patients, namely 35 patients with 21 deaths in the second year; 52 with 26 deaths in the third year; 47 with thirteen deaths in the fourth year; 39 with 10 deaths in the fifth year); 22 from five to eleven years (of 183 patients there were 43 from five to six years, with nine deaths; 38 between six and seven, with six deaths; 33 between seven and eight, with 4 deaths; 32 between eight and nine, with 3 deaths); of persons above this age no one died. According to Geissler, there died in1861 at Meerane, out of 1,754 patients, 63; out of 13 under six months, no one; out of 99 from one-half to one year, 2; out of 221 from one to two years, 19; out of 264 from two to three years, 26; out of 226 between three and four years, 7; out of 204 from four to five years, 6; 1 each out of 187, 151, 144, of six, seven, and eight years respectively, of 227 older children (up to 14 years) no one died. At Frankfort (1860-61), according to Speiss, the mortality equalled for the first year 8 out of 45 cases, or 18 per cent. for the second, 15 out of 156 cases, or 10 per cent.; for the third, 9 out of 204 cases, or 4.4 per cent.; for the fourth, 3 out of 186, or 1.6 per cent.; so also for the fifth (4 out of 243); for the fifth to the tenth, 0.7 per cent. (7 out of 954). According to Kellner, there died at Frankfort IN 1858, 43 children of measles: 8 in the first, 18 in the second, 5 in the third, 4 each in the fourth and fifth, 1 in the sixth and seventh, 2 in the eighth year, above eight years no one. The influence of measles upon the mortality of different ages is strikingly illustrated in the epidemic of the Faroe Islands - as recorded by Panum - to which reference has already been made. During this, that is, in the first nine months of 1846, far more people died than was usual; and of these, in the first year of life, nearly three times more; between one and twenty years the normal proportion; in the third decade 1.4 times more; in the fourth to the eighth decade 2.4 times; 2.6 times, 4.5 times, 3.9 times, 2 times more, between 80 and 100 years 1.5 times more. The chief portion of this excess was due to measles, which is therefore, more dangerous the older the patients are; the

decrease of the mortality in the oldest decades was due to the fact that only 65 years had elapsed since the last epidemic, and the oldest people were therefore, for the most part, no longer liable to attacks of measles, and, therefore, could not, of course, die from them.

In tabular form Panum's figures appear thus:-

	Average Annual Mortality at the Faroe Islands.	Mortality during Epidemic of Measles, During the early months of the year 1846.	
Age-divisions.	Mortality of different age-divisions.	Mortality of different age-divisions.	Ratio of mortality during the epidemic to average mortality. (The latter = 1)
Under 1 year	10.9	30.0	1 : 2.8
1 - 10	0.6	0.6	1 : 1.0
10- 20	0.5	0.4	1 : 0.8
20 - 30	0.55	0.75	1 : 1.4
30 - 40	0.85	2.1	1 : 2.4
40 - 50	1.1	2.8	1 : 2.6
50 - 60	1.0	4.5	1 : 4.5
60 - 70	2.0	7.8	1 : 3.9
70 - 80	6.0	13.1	1 : 2.5
80 -100	16.9	26.1	1 : 1.5

The figures given by the same historian for the epidemic of measles which occurred in Iceland in 1846 (see before) are noteworthy in that they are somewhat at variance with the above; for, whilst the death-rate is high for the first year of life, and for adults over 20 years of age, the Iceland epidemic was particularly fatal to children from one to three years of age. Still further, a large number of cases also occurred amongst adults, in the Iceland epidemic of 1882, varying at different parts of the island. The reason for this high mortality at the most vigorous period of life is not easy to explain. The unfavourable conditions of life in the Faroe Islands affords no solution of the problem, for we have it on Panum 's authority that they were inhabited by a hardy, long-lived race; and 350 out of every 1000 deaths occurred in individuals over seventy years of age, whereas, in Denmark only 150 out of 1000 were at this period of life. In Iceland again, the total mortality was so high that the population had decreased rather than increased in the course of several centuries (and that in spite of the remarkable prolificity of the women) due in great part no doubt to large infant mortality during the first year of life. In Denmark, moreover, the age of 38 is reached by 569 out of every 1000, while in Iceland the same number live only to the age of 14. According to Schlasner's figures for Iceland, for ordinary years (1844 and 1845), the total number of deaths, 1365, were apportioned, with respect to age (showing that once the susceptibility of early infancy is passed the Icelanders exhibit vital resistance to a marked degree) thus:- up to 1 year, 557, or 40.8 per cent.; from 1 to 2 years, 139, or 10.2 per cent.; from 20 to 50 years, 283, or 20.7 per cent.; and from 50to 100 years, 386, or 28.3 per cent.

According to Holt ("Diseases of Infancy and Childhood", New York, 1899, p. 911.), the mortality of measles in children at <u>all ages</u> is from 4 to 6 per cent., while <u>under two years of age</u> it may be 20 per cent., or more.

From 1848 to 1887, according to Williams (loc. cit. p. 923), in England and Wales, there were 367, 602 deaths from measles, and of this number 335, 874 were in children <u>under five years</u> of age, the remaining 31,728 being amongst those of <u>five years and upwards</u>. Thus:-

Age.	Sex.	Number of deaths per 1,000 living at that age.	
Under 1 year	Male	3.01	"
" 1 "	Female	2.51	"
1 to 2 years	Male	5.81	"
1 " 2 "	Female	5.46	"
2 " 3 "	Male	2.88	"
2 " 3 "	Female	2.93	"
3 " 4 "	Male	1.60	"
3 " 4 "	Female	1.68	"
4 " 5 "	Male	0.93	"
4 " 5 "	Female	0.96	"

From the above, it appears that (whilst measles is common enough before five years) its mortality decreases greatly after the second year of life.

At the Hospice des Infants Assistes in Paris, according to Gaunelon ("La Rougeole a l'Hospice des Infants Assistes, Paris, 1892), the measles mortality, during the five years from 1887 to 1891, was: 0 to 6 months, 23.68 per cent.; 6 to 12 months, 55.77 per cent.; 1 to 2 years, 53.94 per cent.; 2 to 3 years, 27.73 per cent.; 3 to 4 years, 13.66 per cent.; 4 to 5 years, 6.20 per cent.; and from 10 to 20 years, none at all.

It appears certain, therefore, that during the first six months of infant life the mortality is comparatively low; after which it rises to attain the maximum during the second year of age, and low again after the fifth year. The following statistical summary, by J.W.Tripe, shows this at a glance:-

MORTALITY FOR MEASLES IN ENGLAND FROM 1868 to 1872.
IN 1000 FATAL CASES THE AGE OF THE PATIENTS WAS RESPECTIVELY.

0-1	1-2	2-3	3-4	4-5	5-15	15-25	25-45	45-65	Over 65.
200	376	190	101	53	72	3	4	1	0

The following table of mortality amongst 3181 cases of measles in the Glasgow Fever Hospital from 1897-99 will serve to make still clearer the stupendous significance of age upon the prognosis:

AGE PERIODS.	MALES.			FEMALES			TOTALS.		
	Admitted.	Died	Fatality per cent	Admitted.	Died	Fatality per cent.	Admitted.	Died	Fatality per cent.
Under 1 year	88	23	26	87	18	20.7	175	41	23.4
" 1-2 years	149	50	33.5	157	50	31.8	306	100	32.6
" 2-3 "	202	41	20.3	188	28	14.9	390	69	17.6
" 3-4 "	232	19	8.2	236	27	11.4	468	46	9.8
" 4-5 "	198	7	3.5	206	8	3.9	404	15	3.7
Under 5 years	869	140	16.1	874	131	14.9	1743	271	15.5
" 5-10 "	526	17	3.2	539	18	3.3	1065	35	3.2
" 10-15 "	28	2	7.1	45	---	---	73	2	3.5
Over 15 "	157	---	---	143	---	---	300	---	---

SEX.-

Sex appears to have no influence upon the mortality of measles; according to reports, the number of deaths among boys at one time slightly exceeds that amongst girls, whilst at another it again falls below it.

Effect of the Mortality of Measles upon the General Child Mortality.-

This question has been carefully investigated by

Schiefferdecker and others, from the reports of whom the following quotations will suffice by way of illustration:- At Konigsberg, during six years, of 1,000 deaths 4.2. were due to measles during the first year of life; 23.3 during the second year, 16.8 during the third, 17 during the fourth, 21.6 during the fifth year. Statistics of 18 years given for Berlin, at the corresponding ages, 3.2, 13.7, 15.4, 17.3, 12.7; of eleven years for London, 20.0, 100.9, 111.3, 96.5, 98.0. According to Gregory there died of measles in England and Wales in 1838, 6,514, in 1839, 10,937, in 1840, 9,326 persons.

Other Factors Bearing upon the Prognosis.-

An attack of measles occurring in the debilitated will naturally influence the prognosis very materially; especially should the disease in question be that of tuberculosis, which when latent is apt to lighten up, and rapidly destroy the patient; with the supervention of the morbillous affection. This, however, will vary somewhat according to the seat of the tuberculosis process; thus, if in the lymphatic glands, it would be less unfavourable than if located in the lungs or other vital parts.

Chronic catarrhal ailments are usually aggravated by measles, especially those of the middle and internal ear, and short of actual fatality, the functions of the affected parts may be permanently destroyed.

The greatest danger, no doubt, exists from pulmonary complications, and of these capillary bronchitis and broncho-pneumonia are by far the most dangerous; and it is estimated that no less than one third of all children attacked by the latter during measles succumb to it.

Laryngeal affections are well known to add to the risk of fatality, especially should a diphtheritic lesion be present.

An attack of measles in the rachitic, strumous, or anaemic, is always a serious event, and the greatest care should be taken of such children at epidemic times to obviate the risk.

Hydrocephalus, and other serious, acute, or chronic disorders are obviously of unfavourable prognostic interpretation.

TREATMENT.

PROPHYLAXIS.

Isolation.

The restriction and control of measles demanded and desirable from the point of view of public safety, and measures of isolation as now practised almost everywhere have well justified the trouble and expense entailed, leading in many cases to the disease being for a longer or shorter period entirely stamped out of the districts in question. The greatest obstacle to the procedure seems to be the woeful indifference on the part of parents who seem to regard measles just as kennel owners do the "distemper" - as an inevitable trial of infant rearing. Hence the great mortality even now encountered; and the frequency of aural and other troubles as reported by departmental practitioners. The fact of its infectivity during the prodromal stage, when usually neither parents nor physicians have the power to recognise the developing attack, contributes largely to its propagation, in epidemic form especially.

Much has been, from time to time, written by health officers and others in the way of lay recommendations, and with encouraging results: the more the laity are enlightened as to detection of and conduction, as regards this pest of infancy, the better. In time the hope is justified that the cooperation of the public with sanitary authorities and medical practitioners, will in due course lead to the disease being shorn of much of its malignancy. Medical men should let no opportunity pass of impressing upon the lay mind that (1) measles is contagious; (2)that it is dangerous to life; (3) that it is one of the most frequent causes of deafness; and (4) as such it is a constant menace to the public health. In special testimony of the latter - in addition to what has been said in the preceding chapter - we have: (1) Quains statement ("Dictionary of Medicine", 1883) that the annual mortality from measles is 5 for every 10,000 inhabitants; and the fact that the deaths in 1889, from measles (14,732), in England and Wales were 5 per thousand inhabitants, and in excess of those from both diphtheria (5,368) and scarlatina (6,698). (2). In Glasgow, according to Russell (Handbill issued by order of the Glasgow Health Committee, 1897), the deaths from measles in Glasgow, from 1891-96 were three times as many as those caused by scarlatina, four times as many as enterica, and in excess of all infectious diseases, with the sole exception of pertussis. The parents should, moreover, be reminded: (1) that measles is one of the most dangerous diseases to which a child under five years can be exposed; (2) that it is especially dangerous during teething, or the second year of life, death often resulting from pneumonia; (3) that the longer a child can be protected from measles, the less likely will it be to become deaf or die from the disease; (4) that in delicate or strumous children measles often leads to consumption; and (5) that it is absolutely untrue that having measles - and other children's diseases while young predisposes to or assures better health in after years, as is commonly believed.

Especially valuable are the suggestions of Theodore Thompson (Twenty-fourth Annual Report of the Local Government Board, 1894-95. Supplement containing the Report of the Medical Officer. p. 135) as bearing on this subject; a full account of which can be seen in the Journal of the Sanitary Institute, London (Vol. XVIII, p. 161). Thompson's suggestions may be for convenience summarised under three main headings, thus:-

A. Sources whence information may be obtained as regards the occurrence of measles:-

1. The adoptionof compulsory notification by the medical attendant and householder. Efforts must be made to ensure systematic notification by the householders; as by distribution through the medium of schools, or by placarding of handbills impressing on householders their duty, and their liability if they fail to notify.

2. Careful enquiry, in every instance, to trace , where possible, the sources of infection; supplemented by house-to-house visitation in the immediate neighbourhood, where necessary.

3. Notification by school authorities of any known or suspected cases of measles, of which they have information, and also of the names and addresses of absentees from School. This should be made obligatory in municipal schools, and efforts should be made to enlist the cooperation of the masters or mistresses of private schools and the teachers in Sunday Schools. The information needs to be given systematically, that is to say, during interepidemic periods, as well as when epidemics prevail. Sanitary authorities in receipt of information derived from school authorities should, it need hardly be said, regard knowledge of cases in this way reported to them as possible clues to the detection of other and unknown cases.

4. Information, general and particular, from persons and organizations rendering assistance medical or eleemosynary to the poor, from the clergy, and from church organizations generally.

B. Measures whereby extension of Measles within the invaded dwellings may be limited.-

1. Every household known by the Sanitary authority to be invaded should at once be visited by an officer of the Health Department for the purpose of ascertaining what steps have been taken towards attainment of proper isolation of the sick person, and of advising, if necessary, further efforts in the direction of safeguarding other inmates of the dwelling. In addition to verbal instructions on this subject, printed forms containing similar advice may with advantage be left with the householder. During the infectious period the patient, if not removed to a hospital for infectious diseases, should be kept apart from other members of the family, in a suitable room, and in charge of an attendant who should have no personal communication with other inmates in the house; and precautions of cleanliness and disinfection should be taken.

2. Frequent visits should be made to the household by officers of the sanitary authority, with a view of seeing that the precautions against spread of infection are not relaxed, so long as there is danger of the disease being communicated to others. Such visits should serve also to aid in the early detection of other cases in the same family. For not less than fourteen days after disinfection of the invaded dwelling members of the household should be kept under observation; and they should receive instruction to communicate at once with the medical officer of health on the appearance of any suspicious symptoms.

3. When it is found impossible, owing to inadequate house accommodation or other reasons, to isolate the sick properly, it is most desirable that the patient, if the state of his health permit should be at once removed to a suitable hospital.

4. After recovery of the patient, or after his removal to a hospital, the room or rooms that have been occupied by him, and all articles that may have been infected, should be properly disinfected.

C. Measures whereby extension of measles throughout the invaded district may be checked.-

1. The notification by the Health Department of the occurrence of measles to school authorities.

2. The exclusion from school for a prescribed period or pending the production of a medical certificate of (a) all members of invaded households; (b) children known to have been in personal communication with houses in which measles is known to have broken out; (c) children of households not yet invaded but in close relation with the houses invaded already.

3. Closure of elementary schools. To be effectual this must include all private schools for young children, and all Sunday-schools. If it cannot be made universal it is not worth attempting. To close the day-schools and leave the Sunday-schools open may be expected to have the effect of spreading the epidemic over a longer period of time without producing any such diminution in the total number of cases as would compensate the community for the great inconvenience caused by the closure of the elementary schools. School closure, if resorted to, should not be adopted while there is reasonable prospect of effectively controlling measles by other means; nor on the other hand should it be postponed until prospect of benefit from this measure has well nigh disappeared.

4. Precautions with reference to library books. The librarians of public libraries should be systematically informed by the sanitary authority of the names and addresses of all persons known to be suffering from measles, with a view to not supplying books to any member of an invaded household until further informed by the sanitary authority that this may be done with safety.

5. Prohibition of those residing in invaded households from carrying on their occupations, when such a step appears necessary.

6. Instruction of the public upon the gravity of measles, especially among infants and young children.

7. Temporary addition t o the Sanitary Staff during times of epidemic prevalence of measles, for the purpose of effecting the necessary enquiries, visits, disinfections, &c.

The following handbill issued by order of the Glasgow Health Committee gives equally useful suggestions:-

"HINTS ABOUT

the

PREVENTION OF MEASLES

"The Committee of Health of Glasgow hope that parents and others will read this paper carefully, and adopt the instructions which it contains, and any others given by the medical attendant having the same end in view.

"MEASLES IS A DANGEROUS DISEASE, one of the most dangerous with which a child under five years can be attacked. It is especially apt to be fatal to teething children. It tends to kill by producing inflammation of the lungs. It prepares the way for Consumption. It tends to maime by producing inflammations of the ears and eyes.

"In Glasgow, during the last five years, measles has caused three deaths for every one which has been caused

by Scarlet Fever. Only one infectious disease has been more destructive of life, viz. whooping-cough. Measles has carried off more than four times as many persons as enteric fever.

"It is, therefore, A GREAT MISTAKE TO LOOK UPON MEASLES AS A TRIFLING DISEASE.

"The older a child is the less likely it is to catch measles; and, if it does, the less likely is it to die.

"If every child could be protected from measles until it had passed its fifth year, the mortality from measles would be enormously decreased.

"It is therefore, A GREAT MISTAKE - because, as a rule, children sooner or later have measles - TO SAY "THE SOONER THE BETTER", and to take no means to protect them, or even deliberately to expose them to infection.

"It is wrong for mothers with children in arms to go into houses where measles exists.

"Every child ill of measles ought at once to be put to bed and kept warm. The mildest cases may be made serious by a chill. Measles is for this reason most dangerous in winter and spring.

"A case of measles continues infectious for at least three weeks after the appearance of the rash. During that time separation from the healthy ought to be secured either by removal of the sick to the hospital or by isolation at home.

"Isolation means not merely a separate room for the sick, but the withdrawal of apparently healthy children of the same family from school,(day and Sunday) and the exclusion of strange children from the house.

"The isolation, as far as possible, from other children belonging to the same family is more necessary in the case of measles than of any other infecticus disease, because of this peculiarity.- FOR DAYS BEFORE THE RASH COMES OUT, THE CHILD IS HIGHLY INFECTIOUS.

"School teachers especially ought to be familiar with the appearance of children in this stage of measles.

"The eyes are watery; glistening and sensitive to light; there is a ringing cough, sneezing, and running from the nose, with a flushed face; in short, all the signs of a bad "cold" in the head."

"NO CHILD SHOWING THESE SYMPTOMS OUGHT TO BE ALLOWED TO GO TO SCHOOL.

"ANY CHILD OBSERVED AT SCHOOL WITH THESE SYMPTOMS OUGHT TO BE SENT HOME AT ONCE. Such children are to be looked for more particularly in the Infant Department."

The following handbill issued by the Michigan State Board of Health, in February, 1900, will also serve as a useful model:-

"HOW TO AVOID AND PREVENT MEASLES.

"Avoid the special contagium of the disease. Do not let a child go near a case of measles; this is especially important to be observed by Guardians of children between one and two years of age. Do not permit any person or thing, or a dog, cat, or other animal, to come direct from a case of measles to a child. Unless your services are needed, keep away from the disease yourself. If you do visit a case, bathe yourself and change and disinfect your clothing before you go where there is a child.

"Do not permit a child to ride in a hack or other closed carriage in which there has been a person sick with measles, except the carriage has since been thoroughly disinfected.

"Do not permit a child to wear or handle clothing worn by a person during sickness or convalescence from measles.

"Beware of any person who has a cough or sore throat; do not permit a child to kiss or take the breath

of such a person, nor to drink from the same cup, blow the same whistle, or put his pencil or pen in its mouth."

Notification.-

That measles is not included in the list of infectious diseases under the Infectious diseases Notification Act is a matter of sincere regret; the Sanitary authorities have, however, the discretionary power of making it temporarily notifiable under urgent necessity. The huge payments required to be made out of the rates for notification fees acts as a deterrant; so too the fact of notification of measles when put to a lengthy test, as at Edinburgh, having failed to effect the purpose intended: Sir Henry Littlejohn himself in a recent annual report recommended its discontinuance. One advantage, however, accruing lay in the fact of its leading indirectly to the discovery of Scarlet fever cases resembling measles. If notification is to be of value at all, the householder's duty should be enforced, as innumerable cases of measles are not seen by medical men at all. Certain epidemics also might be prevented, as suggested, if it were possible to compel notification only in the inter-epidemic periods and to isolate at the same time. The great value of inhibiting an epidemic lies in the fact that it gives children time to pass ages at which most attacks and the greatest fatality occur.

Inspection.-

The desirability of inspecting a district when measles is about is obvious; and has the special purpose of (1) ascertaining the extent of the disease; (2) discovering unsuspected cases; (3) disclosing persons who have been subject to infection, and preventing their conveying the contagion; (4) warning parents and guardians as to the prevalence and distribution of the disease; (5) prohibiting healthy children from an infected house, attending school. This inspection will, of course, be carried out by the sanitary inspector during the execution of his statutory duties: when necessary, however, a special staff may be appointed.

As a rule the duties of the medical officer of Health are formulated, and should comprise procedure in a case of measles, such as the following:-

(1). Prompt investigation of the disease when either suspected or notified.
(2). Ordering of the prompt and thorough isolation of those sick or infected with measles, so long as there is danger of their communicating the disease to other persons.
(3) Seeing that no persons suffers for lack of nurses or supplies.
(4) Giving public notice of infected places by placard on the premises if necessary.
(5). Notifying teachers or superintendents of schools concerning families in which there are cases of measles.
(6). Disinfecting rooms, clothing and premises, and all articles likely to be infected, before allowing them to be used by other persons than those in isolation.
(7). Keeping his sanitary authority constantly informed respecting every outbreak of measles.

These rules should, when necessary and lawful, be enforced in their observance by penalty; and, in the absence of regulations by the Sanitary authorities conflicting therewith, orders by the Medical Officer of Health in the performance of these duties should have the force of regulations by the Sanitary authority itself.

Closure of the Schools.-

Closure of the schools is obviously only of advantage in the early stages of an epidemic, and should only be advised after taking into account the locality affected; the effect of the school closure on the information he will receive regarding the outbreak; and the opportunities for intercourse apart from school. As a last resort, and one likely to be of far-reaching utility, it may be arranged by the medical officer that there be a mutual exchange of information regarding the children absent from school through illness; that the school children be excluded from infected houses; that teachers will give warning of any cases of "cold" which they notice amongst their scholars; and that information be given when the epidemic is observed to be at an end.

The model by-laws of the French Government contain provisos equally drastic, and thorough in detail, for dealing with epidemics in primary schools (Annales d'Hygiene Publique, Sep. 1, 1893); and prescribe: (1) That every child attacked by fever be sent away from school, or, if a boarder, to the hospital, and upon the advice of the inspecting medical officer, the brothers and sisters of the child, and that even all children of the same house, be kept away from school. The family of the child must receive a notice as to the precautions to be taken against possible infection of other children, and as to the necessity of not sending the child back until it has bathed or washed with soap several times and until the clothes have undergone either, disinfection or complete washing in boiling water. (2) Children who have been ill must not return to school without a medical certificate, and not until after a period of time has elapsed since the beginning of the fever equal to that prescribed by the instructions of the Academy of Medicine of Paris. (3) Children attacked by measles must be forbidden to return to school for 16 days, and their books and copy-books, toys and other objects which may have been contaminated in the schools must be destroyed by burning. The class-rooms must be disinfected and when several cases occur within a few days, in spite of all precautions, either the schools must be closed, or exclusion of children under a certain age becomes necessary. If necessary a notice containing particulars as to the epidemic which has required the exclusion can be sent to each family. With regard to the disinfection of class-rooms, the instructions are:
(1). Wash the class-room walls and floor with an anti-septic.
(2). Disinfect by atomization all maps, etc., hung on walls.
(3). Disinfect by washing tables, seats, and furniture generally, completely disinfecting the desks of patients, destroying books, toys, etc., by fire.

General Methods.-

Thorough disinfection should be aimed at, and no trouble spared to make it as effective as possible. Thus, at once should be burnt, or disinfected, all secretions from the nose, eyes and mouth, after removal by pledgets of cotton wool. The patients dejecta-urine and faeces - should be disinfected in the ordinary way and buried at least 35 to 40 yards away from the dwelling, failing which they may be flushed down the sewer from the closet, the basin of same being promptly disinfected thereafter. Of disinfectants for sick room use little need be said: they are numerous and can be had everywhere. For disinfection of the water-closet, chamber utensils, and so forth, Chloride of lime is both non-poisonous, inexpensive and efficient, and one pound of it will make three gallons of reliable disinfectant, a quart of which will serve the day's demand. For disinfecting sheets, patient's clothes etc., one gallon of this solution may be added to ten gallons of water:

the fabric (provided it be white) can be immersed in it for two hours or so before being carried from the room. Of the other disinfectants - specially suited owing to having no odour for a case of measles - permanganate of potassium and corrosive sublimate are to be recommended. They may with advantage be combined in the proportion of one part of each to eight gallons of water. It need hardly be remarked that it is quite unsuited for the disinfection of sinks, drains and sewers, it is less efficient than chloride of lime. Its poisonous nature must be remembered, and the attendants advised thereto. Provided the odour be not objected to, Carbolic Acid may be used with confidence. Articles of clothing and bedding which come from the patient should be washed separately, and with anti-septic precautions: on no account may they be sent to the public laundry, as it is to be feared is too often the case. The physician need not be reminded as to measure of personal asepsis to be instituted; and the risk which he runs of carrying the infection from house to house for all that is known to the contrary. It is better in this respect to err on the safe side.

After the patient's recovery, he should be thoroughly bathed, and clad afresh, before being brought into an uninfected apartment. The sick-room and its contents must now be thoroughly disinfected in one or other of the ways laid down in public health manuals.

Should the patient have died, the remains should be coffined without delay, an ounce or two of formaldehyde being, at the same time, sprayed upon the clothing. The number of persons attending the obsequies should be as limited as possible, and restricted to those who have already suffered from measles.

All books from public libraries or elsewhere should be thoroughly disinfected before being returned to circulation.

TREATMENT DURING THE ATTACK.

In the treatment of measles, as of the acute exanthemata in general, the axiom must be borne in mind that the disease in its natural typical development cannot be interrupted, and leads to recovery, provided the fever and the local disturbances remain within their normal boundaries, and no dangerous complications intervene. The medical attendant has, therefore, little more to do, in the majority of instances than to watch the course of the disease, to oppose injurious influences, and to place the patient under those circumstances in which interference with the normal course are as far as possible obviated . All this is accomplished if the patient be ordered to take to his bed; to have his diet suitably regulated; his thirst quenched with water; his apartment ventilated and kept at a temperature of 65°F, and somewhat lightened in his immediate neighbourhood, as elsewhere.

Inoculation.-

Attempts from time to time have been made to immunize against measles. Thus: (;). Thompson (loc. cit), after inoculating nine previously uninfected children with fresh serum from a patient suffering from measles, observed a rubeoloid eruption, of three day's duration, about the point of inoculation: in four of the children referred to the immunity thus conferred was regarded as complete. (2). Weisbecker, inoculated children with the blood-serum of measles patients, but with negative result. (3). On nine occasions Hubert and Blumenthal, by a similar procedure cut short the disease.

These experiments, however, having been incomplete, as well as inconclusive, serum therapy in measles may be regarded as unreliable.

Red Light.-

Chatiniere (Presse, Med., April 28. 1900) claims to have used red light in measles with good effect; and reports his having aborted the attack in nine instances; the recovery being complete in three to five days after the appearance of the first symptoms of the disease.

The Sick-room:- Nursing.-

It goes without saying that the air which the patient has to breathe must be kept as pure as possible, and this by efficient ventilation. Failure to attend to this point constitutes a frequent cause of bronchitis, from the irritation produced by the dust particles upon the inflamed bronchial mucous membrane. In measles more than in any other febrile disease does the patient require fresh air and this consistent with a temperature of 65°F, avoidance of draughts, and a moist atmosphere, a dry air obviously favouring the diffusion of dust and germ-bearing particles. The necessary moistening can be effected by the use of a steam kettle or a suitable spray, to which a little anti-septic (e.g. 2 per cent formaldehyde) may be added or not.

There being a special tendency on the part of the laity to exclude the outside air, the securement of the temperature suggested is almost invariably a difficult matter and of frequent contention. A still more common lay error is to darken the room, an unfortunate circumstance as sunlight is well know to be one of the most potent of germicides. The rays of light should, however, not be allowed to fall directly upon the patient's eyes: this can be easily prevented by having the bed with its head to the window, or by means of a suitable shade. At night, the light used should be similarly guarded, and be arranged to approximate that of twilight. To prevent serious ocular mischief reading on the part of the patient must be strictly prohibited.

Absolute cleanliness must be the rulethroughout, both as regards the furnishing of the room, the patient and his attendant. The suggestions as to disinfecting made whilst dealing with the subject of prophylaxis apply with equal force at this juncture. The eyes of the patient must receive very particular attention, and for such boracic acid is perhaps the best protective against complications. Before interfering with the patient in any way, the nurses' hands must be rendered aseptic in some approved manner.

The patient should be kept in bed for ten days after the commencment of his illness, by which time desquamation will have ceased. Some variation of the monotony of the illness may be secured by the alternate use of a day and night room, each being disinfected when unoccupied.

The patient may with advantage, and with due precautions against chill, have a tepid bath each day, either by sponging each part seriatim, or by means of the plunge, according to indications.

To assuage the thirst, always complained of, cool water is as good as anything else; aerated waters are of course, permissible, and to all, phosphoric acid (teaspoonfull to the gall) may with advantage be added.

The diet in a case of measles should be as simple as possible, and the simpler as a rule, it is the better; still more so in severe illnesses and during hot weather when the predisposition to catarrhal affection of the intestines. is present. Milk makes the best diet; and it can be diluted if necessary, with water, soda water, or aerated water. The diet may be varied, and the appetite tempted by such procedure as described in works specially devoted to invalid cookery, in most of which the diet in febrile cases is fully described.

Alcohol is seldom needed in ordinary measles, and

should be withheld unless specially indicated. As a substitute for alcohol, one ounce of glycerine may be combined with eight ounces of water, and half a teaspoonful of citric and tartaric acid, given daily; of this Semmola and Dujardin -Beaumetz (Rev. des. Mal. de l'Enfance, Aug, 1888) speak very highly.

Treatment of the Pyrexia.-

Hydrotherapy. As a rule a typical case of measles does not usually call for antipyretic treatment. It is, nevertheless, important that the temperature be kept within reasonable limits; and for this purpose cold may be employed in the form of douches, baths and spongings. Tepid baths, cold packs and sponging of the many methods hitherto recommended, are those now most often employed. The disadvantage, however, attached to sponging must be remembered, and lies in the unavoidable irritation of the skin, which the procedure entails. The special recommendation attached to hydrotherapy is in the respects that, (1) it usually affords to the patient more speedily and safely than any other antipyretic method a sense of comfort, (2) that it shortens convalescence by permitting the patient to return to open air activity sooner than otherwise possible, and (3) that it favours cleanliness of the body, an important precaution in the prevention of certain complications. Again, whilst it is indispensable to combat by means of cold a dangerously high fever, it is no less desirable to control in time a temperature which tends repeatedly to exceed definite limitations. Amongst the special indications for hydrotherapy there are three which stand out supreme:- (1). Sudden pyrexia with cerebral symptoms,; (2) Pyrexia with bronchitis; (3) to relieve the inevitable discomfort of ordinary attacks.

Experience proves that the best method is to give, for about two minutes, a douche of cold water (59°F), the water, when cerebral complications are present, being particularly directed to the head and neck. Failing the alleviation of the cerebral symptoms and reduction of the temperature by this means, hot douching alternating with cold may be tried, friction being made all the while, and the procedure repeated as often as called for by the exigencies of the case. Due precautions must, of course, be taken to guard the child against the risk of heart-failure, both during and after the bath, the temperature being taken per rectum if required, after the bath, and a tablespoonful of wine given at the same time. The efficacy of hydrotherapy is strikingly demonstrated in malignant cases, which it often saves after all other remedial measures have been tried.

When necessary ice-bags may be applied to the scalp or neck and often affords more prompt relief than the foregoing.

Should compresses be used, it is important to note that they should be frequently changed.

Excellent results have been described with cold baths in the ataxo-dynamic forms of measles, by Juhel-Renoy and Duponchel (La Tribune Med., May 15, 1890); while Dieulafoy (La Med. Mod., June 26. 1890) reports instances of the cold baths-to the number of four - gave speedy relief in cases where the disease was rapidly assuming a malignant form.

Baths, according to Fodor (Blatt. f. Klin. Hydrother July, 1891), should be given every hour, when the temperature rises above 102.2°F.; one only, however, is recommended to be given during the night.

In the second class of cases - pyrexia with bronchitis - hydrotherapy is specially indicated for the reasons that (1) the higher the temperature in these cases the more rapid and shallow the respirations; (2) the consequent diminution in the expansion of the lungs; (3) the tendency to atelectasis and consequent cutting off of portions of the pulmonary tissue; (4) the danger of C O_2 poisoning, and of

insufficient oxidation of the blood.

Hydrotherapy affords striking relief also in those cases in which the bronchitis is severe from the invasion of measles, where, of course, the existing pyrexia will be aggravated by the outbreak of the eruption; capillary bronchitis too, almost invariably manifests speedy response to hydrotherapeutic measures properly supervised. Cases of a mild character coming under the third division have the febrile discomforts satisfactorily relieved by the cool baths, which may be given as often as desired during the day, and perhaps twice at evening: the temperature of bath need not exceed 82°F, nor the immersion in same, fifteen minutes.

Care of the Skin.-

Due attention must be paid to the condition of the skin throughout the attack, and eruptions, so common about the mouth, controlled by suitable antiseptic ointments. Vesicles or pustules on the body should be kept in an aseptic condition, and for this a saturated solution of boracic acid proves of marked utility, the fine power remaining imbedded in the skin, and destroying the offensive emanations therefrom.

Itching - which is always annoying and frequently the cause of impetigo from scratching - may be kept within bounds by the application of carbolised vaseline or of eucalyptus in oil.

During the stage of desquamation, the child should receive one or two warm baths and be put to bed thereafter. So too during convalescence, remembering always that a chill is apt to be contracted unawares after the illness; so that a cold douche following each bath would be a wise precaution.

The older writers especially consider the degree of development of the exanthem of vital importance, and numerous indeed are the directions in some of these to promote it. As recently as 1897 one finds Larrabee (Pediatrics, Oct., 1, 1897) recommending, for the prompt development of the rash, the administration of the iodides with diaphoretics, or application of hot packs smeared with mustard; and Paulet (New York, Med., Journal., June, 5, 1897), the painting of cocaine upon the skin is an unfailing developer. As tardiness, or mildness of the eruption is usually without direct prognostic significance, such procedure may be regarded as quite unnecessary.

Treatment of Complications.-

With due attention to the foregoing suggestions, the disease usually terminates without any complications arising. Unfortunately, however, this is not always the case, and the great danger throughout is the risk of bronchitis - with its sequel broncho-pneumonia - carrying off the patient To prevent this rules have been formulated by numerous writers of which those of Hutinel ("Complicat. Broncho-pulmonaires de la Rougeole", La Presse Med., vol. V, No. 38, 1897) may, with much appositeness be epitomised at this juncture:-

1. Children suffering from broncho-pneumonia should be isolated; should not be near children having simple measles.
2. Not only developed cases, but cases that show bronchitis, or those that have been exposed to the contagion, may be said to be threatened with broncho-pneumonia.
3. Children should not be grouped; neither those in full eruption of measles, nor those in the stage of incubation.
4. The child should be kept in a condition of cleanliness most extreme. If the skin is not in satisfactory condition, is excoriated, eczematous, or simply dirty, the child should be given a sublimate bath without hesitation, using

1 : 5000 solution, and be made thoroughly clean.

5. Sores, crusts, ulcers impetiginous patches, or eczematous surfaces should be antiseptically dressed with surgical minuteness.

6. There are normally micro-organisms in the mouth, the pharynx, the nasal fossæ, etc., which are capable of becoming virulent and provoking broncho-pneumonia. One should take care of the mucous membranes covering these regions not less carefully than the external tegument.

7. Nasal lavage is more often harmful than useful. It is liable to irritate the delicate epithelium, and often leads to other ~~media~~ nostrils. Boracic in vaseline, or in tepid water, may be gently applied.

Still more stringent precautions are in use against measles and its complications at the Hospice des Enfants Assistes, Paris, and may be here described to specially illustrate the ways in which a hospital, or any other large building with spacious rooms may be used as a place in which to treat measles, and, still further, to show how much can be done even under very unfavourable circumstances, to prevent complications,- especially diphtheria and broncho-pneumonia,- and thus to diminish the mortality of the disease. Thus, the case - mortality from measles at this hospital had been for many years very high: from 1869-72, 48.72 per cent.; in 1878, 42.64 per cent., and from 1882-85, 44 per cent. On the other hand, however, in the Parisian Children's Hospital the death-rate averaged only 26.6 per cent., thus showing that the high mortality at the Hospice could not be due to the severity of the epidemic type. Investigation proves that the high death-rate was in great part due to diphtheria and broncho-pneumonia, for during the six years prior to 1891, of the total number of cases of measles 14.39 per cent., died from diphtheria, 23.75 per cent. from broncho-pneumonia. By adoption of the precautions about to be described in conjunction with more efficient sanitary and therapeutic procedure, the death-rate was reduced from 40 per cent, or more, to 20 per cent.

General Precautions.-

The children were made clean and were kept very warm by swathings of thick cotton under the nightgown. All the attendants, of which there were about one to every four children, and residents were required to wear clean holland overalls; the visiting physician wore a long white apron, over this a long holland coat and an extra holland coat which he changed in each ward. The use of antiseptics was general and very thorough. All children newly admitted into the Hospice were thoroughly cleansed before being sent into the schools. All heads the least suspicious were done up in gauze bandages; and all children suffering from impetigo, or rashes of the slightest description were treated in a like manner. All cases of discharge from the eyes, nose, or ears, were bandaged or plugged with wool.

Special Precautions.-

All cases of broncho-pneumonia were isolated in "boxes". These were spaces partitioned off by glazing, about 8 feet in height and open at the top to the ward. Each contained a door and a window of the ward. There were two beds in each, with their heads about two feet from the wall. These were not kept entirely for cases of broncho-pneumonia but were mainly used for them because: (1). That disease was considered very infectious; and (2) isolation was thought to diminish the severity of the attack. There was also a systematic application of antiseptic precautions to the mouths of the patients and to the drinking vessels used by them.

At the Hospital des Enfants Malades, Paris, an additional precaution was used in infectious cases. Thus,

at meal times a macintosh sheet was spread on the bed and an oblong galvanized wire basket with a tall handle was placed on it. This basket contained a basin for the patient's food and had small divisions at the sides for the condiments, etc. It was carried straight to the kitchen after meals and plunged forthwith into boiling water.

The Eyes.-

Marked affection of the eyes requires the energetic application of cold and frequent cleansing of the parts, and at a later stage somewhat astringent compresses and collyria, with antiseptic precautions throughout. Boric acid, or other mild measures proving insufficient a stronger lotion, as 1 to 2000 solution of corrosive sublimate may be tried.

Stomatitis and Pharyngitis.-

These usually respond to antiseptic sprays and mouth washes, frequently applied, or to a paint composed of glycerine with borax, eucalyptus, thymol, menthol, and the like. Should the stomatitis progress to ulceration a 10 per cent silver nitrate solution will be called for, failing which more drastic treatment with chromic acid or the actual cautery may be required. The incessant cough consequent upon pharyngeal irritability by a cocaine spray of moderate strength - in no case 20 per cent as has been recommended by certain writers.

Laryngitis.-

Consequent upon the first sign of laryngitis a hot foot-bath should be taken and cold compresses should be applied over the region of the larynx: this should produce prompt relief. Failing this treatment must be varied, and hot and frequent fomentation instituted, due care being taken, of course, to avoid blistering, the production of a brilliant redness alone being necessary. All fomentations, after the first, should be given at a lower temperature. Mild cases may require no local measures beyond steam inhalation, with or without the addition of creosote etc., or a suitable astringent spray. Two or three leeches applied to the suprasternal region, usually give marked relief in the severely congested cases. In those showing signs of dyspnoea or membranous formation, the possible necessity of tracheotomy or laryngeal intubation must not be overlooked; and O'Dwyer's recommendation of Dover's powder to relieve the laryngeal spasm of catarrhal and diphtheritic cases, may be expected to contribute greatly to the comfort of the patient. The suffocative form due to stenosis can sometimes be relieved by vigorous counterirritation, failing which the inhalation of oxygen should be resorted to without delay.

Diphtheria.-

This occasional complication of measles requires for its relief exactly the same treatment as it would do were measles not present.

Bronchitis and Broncho-pneumonia.

Of all complications of measles, capillary bronchitis is the most to be feared; and it is, therefore, of urgent necessity that the medical attendant, and nurses, be continually on the alert to detect the first symptoms of the disease. The indications for treatment are threefold, namely: (1). to ensure sufficient aeration of the lungs; (2) to support the cardiac action; (3) to keep the temperature as much as possible within normal limits. The first indication is met by having the sick-room properly supplied with fresh air, the patient's head and thorax being supported on pillows throughout, and his position changed from time

to time to aid in the dislodgement of bronchial secretion. The bowels should be relieved each day with enemata; and the general circulation promoted by mustard foot-baths (1 ounce of mustard to 3 gallons of water). The same effect with reference to the chest should be induced by means of the mustard jacket, made by mixing one part of mustard and 6 parts offlour into a paste with the necessary water, the whole being applied to the chest between two layers of flannel until a satisfactory redness be produced. To help the respiratory efforts alternate hot and cold douches have been found to prove of value; and so too, the use of emetics in getting rid of mucus accumulations in the larger bronchial tubes, but they should not be given when the pulse is feeble and when there is marked prostration or stupor. According to Bartels (loc. cit) the most advantageous method of treating the high fever of broncho-pneumonia of measles is by means of the following procedure:- several thicknesses of cloths wrung out in cold water are laid upon a piece of flannel of sufficient width to protect the bedclothes from becoming wet; the naked patient is then placed upon these and enveloped in them. Lively kicking and screaming ensue, giving depth and force to the previously superficial inspiration; by degrees the patient becomes more quiet and soon falls asleep. The cold wrappings are to be renewed every half-hour, or less, until the temperature, pulse, and frequency of respiration are markedly diminished, which is usually the case in a couple of hours. The wrappings are then removed, the skin dried, the child clothed in clean, warmed garments, moderately covered up, and left to lie until a new exacerbation of pyrexia and of dyspnœa, or of the pains in the chest, renders necessary the repetition of the wrappings; and this point, moreover, must be especially impressed upon the attendants. It is only in exceptional cases that the wrappings must be continued uninterruptedly for several days and nights, or that we are obliged to resort to the use of baths and cold douches upon the head and back. This mode of treatment may have to be repeated daily for weeks, according to the duration of the pneumonic lesion. Wrappings are usually to be preferred to the use of more energetic antipyretic methods, since the cooling of the body is more gradual, and, therefore, irregularities in the circulation and distribution of the blood are probably better guarded against; and they obviate, moreover, the necessity for therapeutic agents, in the majority of instances at least.

Stimulants, such as hypodermic strychnine (1/300 grain to a child of one year old every three hours) may be given; and wine has in these cases proved of marked value. Stimulants are specially indicated when the temperature either falls suddenly (e.g. at the crisis) or is already low; so too, when the pulse shows marked irregularity, rapidity or compressibility. To a child of one year old from one half to two ounces of whisky may be given, diluted with eight ounces of water. Sherry, or other wines, for which children often exhibit a decided liking, may, of course, be given instead. A diet as nutritious as possible under the circumstances will materially contribute to the success of the therapeutic measures. Many cases, according to Lomikovsky (La Med. Mod. Feb. 27, 1895,) undergo a striking improvement consequent upon the administration of digitalis in full doses according to age; but when heart-failure seems about to occur nitro-glycerine (1/500 grain every hour, in young children, for four or five doses), or oxygen inhalations, are to be preferred. The desirability of isolating broncho-pneumonic cases occurring in hospitals has been dwelt upon already whilst describing the procedure at the Hospice des Enfants Assistes, Paris.

Convulsions & Nervous Symptoms.-

Cold applications to the head and nape of the neck will usually allay convulsions occurring with high fever: those common to the invasion of measles in children, and of a minor character call for no special treatment. If preferred, as recommended by Guinon (Blatt . f. Klin. Hydrotherapie July 1891), cold baths may be used,- the water being gradually cooled,- or the water may be poured from a distance upon the shorn scalp. Stimulants, wine, camphor, etc are usually strongly indicated in these cases, and when the patient is severely affected, and the face markedly congested a few leeches to the mastoid process will likewise occasion marked alleviation of the urgent symptoms, in children old enough and sufficiently strong, to stand the loss of blood which the procedure entails.

Antipyrin, (in full doses according to age) ~~in the afternoon)~~ of all internal remedies for cerebral excitement, is most likely to prove satisfactory. In cases showing high fever, prostration and debility the drug being unsafe. should be replaced by the (less efficient) sulphate of quinine (one to two grains three times a day for each year of life), or the tannate (in double or treble the doses of the sulphate) if diarrhoea be present.

Aural Affections.-

The ears in all cases of measles, being particularly liable to be the seat of serious inflammatory complications, should receive special treatment, failing which permanent deafness may ensue. The aim and object of procedure adopted should be the alleviation of existing pain; restoration of the normal atmospheric pressure in the middle ear, removal of secretion from the nose, pharynx, and external auditory meatus, and due attention to indications consequent upon perforation of the tympanic membrane. Thus, the nares may be cleared, with antiseptic swabs of sterilized cotton-wool rolled round a probe and dipped in peroxide of hydrogen, boracic acid, or other mild germicide, of a lukewarmness; after which an ointment of eucalyptus (5 minims) in vaseline (i ounce)may be applied with a camel's-hair brush. The Politzer bag must only be used once a day upon older children; in whom also clearing of the nostrils by blowing alone can be expected. To relieve the pain cocaine (2 per cent) may be dropped into the ear should external hot applicationsfail to effect their purpose. Pus accumulations in the tympanic cavity must be promptly liberated by incision of the drum, in the lower segment, the child's head being held by an assistant in a suitable reflected light; following which the aural canal must be washed out, thrice daily, with warm water and by hydrogen peroxide, incision of the drum being repeated should the opening close up in the meantime. It is particularly important that the drum be not allowed to rupture spontaneously, or permanent deafness may follow: this must be anticipated by incision when bulging be observed. Extension of the process to the mastoid will demand the usual operation for its relief.

Epistaxis.-

A slight amount of nose-bleeding at the onset of the morbillous attack, calls for no special treatment, but, if intractable, can usually be arrested by hot water douching, failing which the nares may be injected with strong astringents (sulphate of Zinc, or ferric-perchloride), and then plugged with antiseptic wool, frequently changed to prevent pharyngeal or aural sepsis.

Other Complications.-
Whatever, their nature, must be treated on general principles as they arise, thorough antisepsis, being the key-note of successful procedure throughout. This is especially so in the case of measles occurring during pregnancy, should premature delivery occur.

Management of Convalescence.
This too, should receive attention, according to indications, the nature of which will be apparent from consideration of general principal practice and some of the foregoing remarks.

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