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INFLUENZA IN HORSES.

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In presenting the following report on influenza, I beg to acknowledge my indebtedness to correspondents of the Agricultural Bureau for valuable information concerning the progress of the malady, and also to the various scientific men mentioned in the text, who have all responded promptly and heartily to any request for information or assistance.

While much that is of value has been secured, and especially on the question of the causation of the disease, I would respectfully submit that certain points require further investigation, and are yet capable of elucidation, inasmuch as the malady is still progressing and continually invading new territory.

I would refer especially to the observations on the amount of ozone in the air, and the disturbance of atmospheric electricity, both of which were remarkably in excess at Toronto in September, and the former at Lansing, Michigan, during the visitation. By instituting a series of experimental observations at different non-infected places, as the Southern and Western States, including the Pacific slope, and continuing these until the disease is at its height, the question could be decided as to whether these are essential accessory causes. It has been sufficiently demonstrated that they are not the true specific causes.

Another point which wants elucidation is the inoculability of the disease, or its transmissibility, by transferring the blood of a sick animal into a healthy system. The limitation of the poison to the air passages, which the failure to transmit the disease by transfusion would seem to imply, would have a very important bearing on the question of prevention and treatment.

Definition. - An epizootic specific fever of a very debilitating type, with inflammation of the respiratory mucous membrane, and less frequently of other organs, having an average duration of ten to fifteen days, and not conferring immunity from a second attack in subsequent epizootics.

Synonyms. - The corresponding disease in man was known to the older physicians as *Peripneumonia notha, P. typhoides, P. catarrhalis, Pleuritis humida, Fidris catarrahlis, Catarrhe plumonaire, Catarrhus á contagio, Defluxus catarrjalis,. Cephalagia contagiosa, Rheuma epidemicuno,* &c. As seen in animals it has received the following designations: Epizootic catarrh, catarrhal fever, gastro-catarrhal fever, mucous fever, gangrenous peripneumonia, epizootic pleuro-pneumonia, entero-pneumo-carditis, epizootic nervous fever, distemper, *blitz katarrh,* rheumatic catarrh, *la grippe, cocote, typhose, septicœmio,* &c

Past History. - The frequent co-existence of an epizootic catarrh in man and the horse, and to a less extent in other animals, lends some color to the hypothesis that they are due to closely-allied causes. The records of its prevalence in man might therefore be profitably referred to as illustrating the action of such causes at a time when veterinary records are few and imperfect.

Between 415 and 412 before Christ, Hippocrates and Livius report the extraordinary prevalence of catarrhal maladies in Greece and Rome, which Schuurrer and Hæser suppose to

have been influenza. Diodorus Siculus reports an epidemic, apparently of the same kind, in the Athenian army in Sicily in 415.

Absyrtus, a Greek veterinarian, writing about A. D. 330, describes a disease in the horse having the general characters of influenza. This appears to be the earliest record of such an affection in the lower animals, yet the reports of epidemics at an earlier date almost necessarily imply the existence of the equine malady.

Passing over a number of epidemics, we come to the next recorded equine influenza in A.D. 1299. In this year a catarrhal epidemic spread widely in Europe, (Parkes.) The equine disease is thus described by Laurentius Rusius, as it prevailed at Seville: "The horse carried his head drooping, would eat nothing, ran from the eyes, and there was hurried beating of the flanks. The malady was epidemic, and in that year one thousand horses died."

Six epidemics of influenza are recorded in the fourteenth century, but among animals nothing more than an epizootic quinsy at Rome, from which Rusius, who reports it, lost fifty horses.

We have no distinct evidence of influenza in animals in the fifteenth and sixteenth centuries, though in 1510 and 1580-'81, during the prevalence of cattarrhal epidemics in Europe, animals suffered severely, from what disease is not stated, (Saliua Diversus, Thomas Short.)

Solleysel describes an epizootic among the horses of the French army, operating in Germany in 1648, which closely agrees with influenza. It began by fever, great prostration, tears running from the eyes, and a profuse greenish mucous discharge from the nostrils. The appetite was lost and ears cold. Few recovered. This appears to have closely followed the epidemic influenza of 1647, mentioned by Hensinger.

In 1688 influenza was epidemic over the whole of Europe, spreading from east to west. In England and Ireland it was immediately preceded by a nasal catarrh, from which horses universally suffered, (Short, Rutty.) In 1693 it again prevailed over the whole of Europe and the British Isles, attacking first horses, and then, after a short time, men, (Webster, Short, Forster.). In 1698, during an epidemic catarrh in France, cattle and horses suffered from what was described as a bilious plague, (Bascom.) The year following influenza prevailed among horses in France, and severely among men and horses in England, (Webster.) In America in the same year horses were first attacked, and afterward men, (Forster.)

The year 1707, remarkable for an eruption of Vesuvius and the upheaval of a new island in the Ægean Sea, witnessed an epidemic catarrh in Franconia, (Steurlius,) and in England, where horses also suffered, (Short.) A similar eruption, with earthquakes, in 1712, coincided with an epidemic and above all an equine influenza, (Laucisi, Kanold.) In the winter of 1727-'28, horses in Great Britain suffered from epidemic catarrh; in Ireland it attacked man a little later, (Rutty.).

In 1732, seven earthquakes occurred in China, followed by pestilential diseases in man and malignant carbuncular diseases in animals. A little later influenza spread over Europe and America from east to west, (Glugo.) Arbuthnot and others who described it in England remarked upon the sulphurous vapors pervading the atmosphere, and that men and horses were attacked successively. Gibson, who furnishes a full description of the affection in the horse, says that it attacked mainly young or ill conditioned animals, and did not prove fatal. In 1736 and 1737 it again prevailed in England, attacking men and horses. Short, who records this, mentions an eruption of Vesuvius in the latter year. In 1740, 1742, and 1743 violent sore throats prevailed in man, horse, and ox, (Huxham, Rutty, Faulkener;) but whether due to in-

fluenza is not plain. In 1746 and 1750-'51 catarrh was epizootic among horses in Ireland, (Rutty, Osmer;) in 1758 in Scotland and England, attacking man as well, (Whytt, Bascom;) in 1760, after an eruption of Vesuvius, influenza appeared in Great Britain, Ireland, and elsewhere in Europe, attacking first horses, then men, (Bisset, Rutty.) In 1760 it is reported as in Denmark, attacking horses and dogs; and in 1762 in France, Ireland, and other parts of Europe, among horses and men, (Rutty, Bottain.)

In 1767 it prevailed in Europe, and above all in England, where it attacked first dogs and horses, then men, (Forster, Iteunsen;) also in America among horses. It carried off almost all the young horses and colts in New Jersey, and was very ruinous in New England, (Webster.)

In 1776, after a very severe winter and warm summer, with an earthquake in Wales, influenza spread over Europe. Fothergill, Cumming, Glass, Haggarth, and Pultney, in England, and Lorry, in France, noticed that horses and dogs suffered before it attacked human beings. Huzzard speaks of the horses suffering last. Poultry died in great numbers from an epizootic with defluxions from the eyes. In 1780, after eruptions of Vesuvius and Etna, and a terrible earthquake in Taurus, influenza appeared among horses. Huzzard describes it as seen at Paris. Gluge and Hensinger say that it broke out epidemically in September, 1780, in China, and, spreading over Asia, reached Moscow in December, 1781, gained Revel and Western Prussia in February, 1782, and Spain and Italy in August and September. Forster says it prevailed in America in the spring of 1781, and the following year in Europe. Haveman records an equine influenza at the same time in Germany, and Abilgaard leaves a monograph on the disease as it prevailed in the royal stud at Copenhagen. This year was rigorously cold all over Europe. In 1798 influenza again prevailed among horses in England, (Wilkinson, White.)

In 1800 influenza was said to have prevailed at Whampon, in China, whence it was believed to extend over Asia, reaching Europe in 1802 and England in January, 1803, (Gluge.) Though in some places man alone appears to have suffered, in others horses fell victims as well, (Hensinger.) In 1814 this affection prevailed in horses in Switzerland, (Hensinger,) and 1815, in a malignant form, in England, (Wilkinson, Youatt.) It appeared again in an epizootic form in England in 1819, 1823, (Field,) and 1828, (Brown.)

In 1833 it extended over Europe from east to west, attacking men, horses, dogs, and even cats. It prevailed in Courland from January to March, (Possart;) in Pomerania and Saxony in April, (Rhodes, Prinz;) and in France in May, (Compte Rendu de l'Ecole, Vet. d'Alfort.) In England Mr. Hayes describes it as lasting from October, 1832, to March, 1833. It was a "catarrhal fever, joined with inflammation of the lungs and liver and trachea and œsophagus and larynx and pharynx, and the mucous lining membrane of the bowels, frequently with all the symptoms of malignant catarrh, and these in an aggravated form. In some cases there was excessive diarrhœa, the fæces were black liquid mucus, bloody and exceedingly fetid, and accompanied by such extreme debility that the animal could not move without falling; there was quick pulse, injected nose, mouth and gums as red and dry as possible, and resembling a piece of lean dry beef. In some there was excessive anasarca; in others phlegmonous tumors in different parts of the body; in others again there were spasmodic jerkings and lameness in the legs, shoulders, and hips."

In 1834 it is reported in Brandenburg, (Hensinger,) and in 1835 and 1836 in France and England, (Prinz, Veterinarian.) In the spring of 1845 it again prevailed in England, and in July became complicated by a severe inflammation of the eyes and dropsies beneath the belly and on the legs. (Veterinarian.) During the great influenza epidemic of 1847, it prevailed exten-

sively among horses in Europe, and was unusually prevalent in England in the two following years as well. Since that time it has been especially prevalent in Great Britain, in 1851-'52, 1854, 1856-'57, in the early summers of 1862 and 1863, and in the latter part of 1871.

Past history of the influenza of 1872. - According to information received from Professor A. Smith, veterinary surgeon, Toronto, the first cases occurred in the townships of York, Scarboro', and Markham, about fifteen miles to the north of that city, among the last days of September. He says, "I think the first cases were noticed among horses running at pasture." Cases were seen in the city of Toronto by October 1, and in three days it had attacked nearly all the horses of the street-cars and livery-stables. On October 18 it was reported as general in Montreal and Quebec and throughout the Dominion.

Several Canadian horses were introduced into Detroit on October 10 or 11 suffering from what was supposed to be a catarrh. On arrival they were at once placed in a large stable in the city, but almost immediately transferred to a smaller one to guard against the possibility of contagion. Two days later the disease showed itself in the horses occupying the larger stable, and in three days all of these were attacked. Meanwhile it had appeared in the smaller stable as well. No other cases are known to have occurred in the city until October 20, and soon after this it became general. Two of the imported horses were well enough to work from the first, and were constantly on the streets in the business part of the town.

On October 14 it was reported in Buffalo, New York, and was general by October 21. By October 17 Rochester had half its horses ill, and West Batavia bad been attacked.

On October 19 it existed in Syracuse in newly-arrived Canadian horses; on the 22d one hundred to two hundred were sick in boarding and livery stables, and it spread with great rapidity in the country around.

As early as October 20 it was reported in Warren County, Pennsylvania; on October 21 at Depauville, Jefferson County, Attica, Wyoming County, and Steuben County, New York, and Keene, New Hampshire. On October 22 at Brooklyn, New York, Jersey City, and Boston. On October 23 it was prevalent at Newburgh and in the country round New York, in the towns situated on the New York Central Railroad, from Syracuse to Albany inclusive; in Hartford and New Haven, Connecticut; in Block Island, in Providence, and Newport, Rhode Island; in Lunenburgh, Vermont; in Bangor, Portland, and Augusta, Maine; in Washington and Carrollton, Ohio, and in Chicago, Illinois. On October 24 Lexington, Sanilac County, Michigan, and Baltimore, Maryland, were affected. On October 25 the first cases appeared in Oswego, New York, also in Clarkstown, Buckland County, and in Livingston County, New York; Westfield, Massachusetts; Lewistown, Bethel, Topsham, and South Parsonfield, Maine, (at the latter place, which is thirty miles from a city, the first case was a horse from a city stable, and a week later a colt in the same stable.) It was also reported at Corry, Pennsylvania, at this date. On October 26 it reached Sheridan, Chautauqua County, New York, and Pontiac, Michigan. On October 27 it attacked Glens Falls, Catskill, and Poughkeepsie, New York, and Rockville, Tolland County, Connecticut; in the last case it was supposed from Springfield, Massachusetts. On October 28 the Watertown street-cars were stopped, and the disease had just appeared at Binghamton, New York, Paterson, New Jersey, Philadelphia, Pennsylvania, and Washington, District of Columbia, October 28; in the last place in sick horses brought from the North.

On October 29 it was announced in Washington county, Vermont; in West Chester County, Port Jervis, and Carmel, New York; at Titusville, Pennsylvania, and Columbus, Ohio.

On October 30 it was reported for the first time in Peekskill and Nyack, New York. On the

31st it appeared in Little Genesee, in Rosendale, and Deposit, and in Ithaca, New York, having existed since the 25th in Trumansburgh, ten miles to the northwest of the place last named, and slowly reached Varna, three miles to the east of Ithaca, on November 6. Pittsburgh, Pennsylvania, and New Hope, Pennsylvania, were reached on October 31, the first of these places by five or six horses brought from New York City to the livery stables of Messrs. Moreland and Mitchell; the street-cars had to be stopped on November 5 for the lack of horses. Yet even up to this date Belmont's horses at Babylon, Long Island, and McDaniels's at Saratoga, were still reported sound.

On November 1 it reached Kingston, on the west side of the Hudson and Washington County, New York, attacking first the livery and canal horses, contrary to what occurred at Buffalo, where canal horses escaped until October 22. Is this difference to be accounted for by the fact that the canal did not extend into Canada?

At the same date it was reported at Germantown and Lancaster, Pennsylvania; Cincinnati, Bucyrus, and Etna, Ohio; Romeo, Michigan; Portsmouth and Chuckatuck, Virginia, and Newark, Delaware, starting in the last case with a horse just arrived from Baltimore, Maryland.

On November 2 it appeared at Adams, Massachusetts; on the 4th at Pittsfield; on the 5th at Great Barrington, and on the 6th at Richmond; all in the Hoosac Valley. On the same date it was observed at Charleston, South Carolina, in town and country at once.

On November 3 it broke out at Elyria, Ohio, confining itself for five days to teams which had been driven to Cleveland; at Goldsborough, North Carolina, and Columbia, South Carolina.

On November 4 it was reported at Springfield, Illinois and in Lehigh County, Pennsylvania, where "it spread like fire along the canal and into the surrounding country."

On November 5 it was reported in Tioga, Elk, Chester, and Wyoming Counties, Pennsylvania, and at Grand Rapids, Michigan.

On November 6 it reached Cooperstown, Otsego County, New York; Greensburgh, Pennsylvania, and Richmond and Campbell County, Virginia; and on November 7 Butler County, Pennsylvania.

On November 8 it had attacked Montcalm, Livingston, and Ottawa Counties, and Lincoln and Tuscola, Michigan; Ravena, Ohio, and Danville, Virginia, where it prostrated 75 per cent of the horses in twenty-four hours.

It was reported, November 9, in Hampton, Virginia, and two severe cases at Johnstown, Cambria County, Pennsylvania, where, however, it did not become general till the 24th, so that these must be considered questionable.

November 10 it existed in Sandusky, Ohio, on November 11, at Marshall, Michigan, Indianapolis, Indiana, and Savannah, Georgia.

November 13 it reached Scranton and Forest County, Pennsylvania, Hamilton and Marion, Ohio, and Wilmington and Tarborough, North Carolina, while it had reached its height at Louisville, Kentucky, and Milwaukee, Wisconsin, and was merging into dropsical and other fatal complications in Buffalo, New York, Baltimore, Washington, Philadelphia, and Raleigh, North Carolina.

November 14 it existed at Toledo, Ohio, and Lynchburgh, Virginia, and was nearly universal in Buckingham County and at Wheeling, West Virginia. November 15 it was reported in Mechanicsburg, Grampian Hills, and in Clearfield County, Pennsylvania, in Defiance, Ohio, and Madison, Wisconsin.

November 16, in Beaver County, Pennsylvania, and 17th at Cedar Springs, Clinton County, having traveled northward along the Susquehanna River. It had existed to the southeast and west for several days previously.

November 18 it broke out at Atlanta, Georgia, and Chattanooga, Tennessee. At Nashville, Tennessee, it broke out between the 15th and 20th, and spread slowly, so that exact figures are difficult to arrive it. At this time it prevailed in Giles, Rutherford, Manry, Davidson, and Sumner Counties, at points recently visited by a circus, which came from an infected district. At Memphis, Tennessee, it existed in a mild form on the 19th.

November 21 the street-cars in Augusta, Georgia, were stopped, and the first thirteen cases occurred at Martha Furnace, Blair County, Pennsylvania. November 24, fifty horses and mules were attacked at once at Johnstown, Cambria County, Pennsylvania.

November 27 the street-cars were stopped at Halifax, Nova Scotia, on account of the disorder; it was reported to be spreading rapidly in New Orleans; and had appeared in Jacksonville, Illinois, Keokuk, Iowa, and Montgomery, Alabama.

November 28 it was reported at Jacksonville, Florida; November 30 it prevailed in Fulton County, Georgia, and Newberry County South Carolina, making a westward progress.

December 2 it broke out in East Saint Louis, Missouri; December 3, in Boonville, Missouri, and Omaha, Nebraska.

December 7 it reached Havana, Cuba, attacking native and northern horses alike. On December 14 it had reached its height, many horses were dying, and Mexican horses were being imported by the Spanish government.

The outbreak has varied widely in its nature at different places. Sometimes it has spread slowly along the course of railroads or turnpikes, and its progress can be very satisfactorily connected with the intercourse between the different places attacked. In other cases it appears, from the reports, to have struck down a whole city or limited district in twelve or twenty-four hours, and in a manner which it appears impossible to account for otherwise than by some subtle and generally pervading influence. The earliest reports of the disease from many points allege that colts, mares, and other animals, running at grass, have escaped, but later intelligence seldom or never fails to report their sickness. So, too, at Scranton and other mining regions in Pennsylvania the mules working underground kept well for about six days after those on the surface were suffering. The majority of the reports testify that animals at grass in mild weather were later in being attacked, and suffered less than those in regular work and stabled. Yet some report that those at pasture and away from all other horses suffered as early and as severely as those indoors.

The percentage of horses attacked has been variously stated at from 80 to 99. As the reports are mostly written before the disease has quite passed away, it is probable that the latter number is nearest the general average.

The fatality appears to have been from 1 to 2 per cent on a general average, though it has been considerably higher than this in some of the larger cities. The highest reported was at Farmingdale, New York, where it was claimed that 10 per cent of the heavy horses had died. This was, however, drawn from too small a number of cases to be of any value as an average.

SYMPTOMS AND COURSE.

Incubation. - From the analogy it bears to other fevers influenza would be expected to

possess a period of incubation, during which the poison which had obtained access to the system should remain there apparently dormant and without giving any outward sign of its presence, but really undergoing a process of rapid multiplication and establishing its hold on the animal economy. The duration of such incubation has not been definitely ascertained, the disease not having been transmitted by experimental inoculation; but, from the observation of cases in which it has appeared in a stable after the introduction of a sick animal, it is supposed to extend from one to three days.

SYMPTOMS OF THE SIMPLE OR CATARRHAL FORM.

First stage. - The extreme suddenness of the attack is among the most remarkable features of the malady, and one which obtained for it the name of the *lightning catarrh (blitz-katarrh)* among the Germans. It often makes its onset with a sudden and extreme prostration, with intense muscular weakness and drowsiness. A horse in apparently robust and vigorous health is seen with drooping head, ears, and lips, semi-closed eyelids, expressionless countenance, and one or two legs partially flexed, as if to seek relief from his weariness. He stands in one position, or if urged to move does so with reluctance, sluggishness, and often with unsteady, swaying gait. The back is arched and rigid, the limbs carried stiffly, and the joints often crack. At the same time there may be noticed a dry staring coat, a tenderness of the skin when handled, a tendency to coldness of the nose, ears, and limbs, and in exceptional cases shivering, tremors, or even nervous jerking.

A cough is always an early symptom, and in the visitation of 1872 it has been usually the first observed, as it was by far the most prominent of the early symptoms. It commenced as a short, dry, husky cough, frequently repeated, and for the first two days or more unattended by the extreme dullness and prostration above referred to. The temperature is raised to 102^{o} F., the pulse is slightly accelerated and variable in character, but usually weak and easily compressed and rendered imperceptible by the pressure of the fingers. The state of the secretions further betrays the febrile state. The urine is less abundant and higher in color than natural; the dung often rather hard and glistening on the surface from the presence of mucus; the mouth is hot, dry, and clammy, and the mucous membrane of the nose dry and red or pink, with, in many cases, a tinge of brown or yellow, the color being common also to the membrane of the eye. The breathing is slightly accelerated, and if the ear is placed on the course of the windpipe at the lower end of the neck or on the sidle of the chest behind the middle of the shoulder, the blowing sound is heard louder than common. Thirst is increased and sometimes ardent, and the appetite usually slightly impaired or dainty, though in other cases unaffected.

Second stage. - As the disease advances other symptoms appear, and those first seen are usually aggravated. In some cases, indeed, there is no manifest aggravation, the spirit and appetite remaining good throughout, the prostration and fever are all along slight, the husky cough which heralded the disease becomes looser and gurgling or rattling, with the appearance of the discharge from the nose, and a prompt recovery follows as from an ordinary and slight cold.

But usually by the third or fifth day the cough has become deep and painful, occurs in paroxysms of four or five in rapid succession, and racks the entire body with the effort. The eyelids are swollen, and tears run from the eyes. A watery fluid distills from the nose, soon giving place to a thick yellowish or yellowish-green muco-purulent discharge. The temperature

has risen to 105° F., the thirst intense; appetite variable, sometimes lost; pulse more rapid than natural, soft, weak, and easily excited by exercise; and the breathing somewhat deeper than before. The mucous membrane of the nose becomes of a deeper red until the discharge is freely established, sometimes almost purple, with patches of brown or yellow, and even *petechiæ,* or spots of blood staining in the worst cases. Swallowing is painful, the food being sometimes dropped from the mouth after it has been chewed. There is slight swelling and tenderness between the branches of the lower jaw and beneath the roots of the ear. Handling the throat causes wincing, and easily excites a paroxysm of coughing, and the cough is softer and looser if a free discharge has been established from the nose. If the ear is applied over the windpipe or side of the chest, the former harsh blowing sound is found complicated by a rattle, *(mucus râle,)* and the hand applied on the side of the chest, just behind the left elbow, detects the forcible impulse of the heart with each beat. The loins are insensible to pinching in many cases. Unless affected by treatment the dung tends to become harder, firmer, and less abundant; the urine scanty and of a deep yellowish-brown color, or quite opaque from deposited lime salts. In many cases this liquid is thick and sizy, and all specimens which I have examined have shown a neutral reaction and contained albumen in variable proportions. I did not find casts of the uriniferous tubes in a single instance. (See Dr. Caldwell's analysis of urine appended to this report.)

The supervention of a free discharge from the nose, the formation of an abscess about the throat, the occurrence of a profuse perspiration, or even a slight diarrhœa, if attended with a cooler mouth, a firmer, less rapid pulse, a lower temperature and a disposition to lie down, may be looked upon as critical, and is often followed by a prompt recovery.

Third stage. - This is the period of recovery, and is marked by the subsidence of all the morbid symptoms and the steady re-establishment of health. The cough becomes gradually less and less painful and no longer paroxysmal; the relaxed fatuous expression of the countenance ceases; the eye brightens; the spirits and appetite return; thirst diminishes; the discharge from the nose changes from a greenish to an opaque yellow or white hue, and is gradually dried up; the pulse acquires firmness; the impulse of the heart on the ribs steadily decreases, though still easily roused by excitement; the breathing gets easy, and strength and vigor are slowly restored. Considerable bodily weakness usually lasts after all other signs of illness have passed away; the horse sweats readily; flags if kept for some time at action or work, and is liable to relapse if overdone.

But all do not follow this regular and favorable course. Some exhibit a tendency to extreme violence from the first, and others, which begin mildly, soon show signs of dangerous disorder in the chest, in the abdomen, in the joints and muscles, in the subcutaneous connective tissue, or in the eyes. It is these complicated cases alone which are dangerous; the simple catarrhal affection always tends to a favorable termination.

With chest complications. - Even in the simple catarrhal form the respiratory mucous membrane is involved as far down as the lungs, but only in a slight degree. But in some cases the inflammatory action extends beyond the larger bronchial tubes, and invades their smallest ramifications, constituting the redoubtable disease known as a *capillary bronchitis,* aggravated by the debilitating fever of the influenza. The breathing becomes quick and difficult; the nostrils widely dilated; the flanks heave violently; the stupor and prostration are extreme; the mucous membranes are of a dark red or even purple hue; the cough deeper and more painful, the animal setting his feet apart, or perhaps even going down on his knees in his efforts to

dislodge the cause of irritation; the blowing sound heard over the lower end of the windpipe is still louder and harsher than in the other case; and a loud wheezing is heard when the ear is applied over the sides of the chest. The patient stands constantly in this as in all the other complications in the chest, and the fact of his having lain down, and remained so for some time, may be taken as a satisfactory sign of improvement. With this form the patient may literally die of suffocation, the thickened coats of the tubes and the accumulated exudation preventing the entrance of air to the air-sacs in the lungs. Or death may result from the increasing impurity of the blood, which renders it unfit to nourish and sustain the functions of the nervous system and other vital organs. Capillary bronchitis has been a frequent complication during the present epizootic.

If the inflammation extends to the lungs we have the typhoid pneumonia of medical writers, with a greater tendency to a liquid infiltration of the organ than to the firm consolidation (hepatization) characteristic of inflammation of the lungs in a more healthy system. In this case there is the same difficulty of breathing and the same general symptoms as in capillary bronchitis, but the wheezing sound heard over the chest is absent, or nearly so, and in place of this there is a fine crackling (crepitation) along a line circumscribing the inflamed portion, which itself gives out no sound. Percussion over the area which is destitute of murmur brings on a sound comparable to that obtained by striking a solid body, while the still previous portion gives out a more resonant or hollow sound than is natural. This may terminate fatally by complete infiltration of the lung tissue so as to unfit it for the function of respiration, by the destructive effect of extensive suppuration in its substance, by the exhaustion consequent on the excessive drain on the vital powers, or by the increasing impurity of the blood, which finally becomes unfit to sustain the healthy functions. Short of this it may leave permanent lesions on the lungs, such as consolidation of a portion, with short wind, or impaired nutrition and innervation resulting in heaves and dilatation and rupture of the air-cells. In favorable cases the exuded lymph is entirely absorbed, and a healthy state of the lung is restored. In my experience this has been less frequent in 1872 than the bronchitic complication, and has occurred chiefly in animals which have been carelessly exposed when sick, or exhausted and debilitated by work, impure air, or injudicious drugging.

Pleurisy will sometimes supervene, though I have not met with a well-marked case during the recent visitation. Yet in other years it has been so frequent as to procure for the affection the name of typhoid pleurisy. This consists in inflammation of the membranes covering the lungs and lining the cavity of the chest. It is characterized, like the two last mentioned forms, by accelerated breathing, which is, however, short and catching, the inspiration being suddenly arrested by the sharp pain before the chest is quite filled. The spaces between the ribs at the affected part are excessively tender, and at this point in the early stages a slight rubbing sound is heard, caused by the gliding of the dry roughened surfaces of the inflamed membranes on each other. In twenty-four hours this may have passed because of liquid effusion into the cavity of the chest, and in such a case the natural murmur of the lung and the resonance on striking the chest are absent up to a horizontal line corresponding to the surface of the liquid, and this is usually at the same height on both sides. Death may ensue in this case from the accumulation of water so as to fill the cavity of the chest and prevent dilatation of the lungs with air; from the debility consequent on the abstraction of so large an amount. of the blood elements from the circulation, or from decomposition of the effused products and general blood poisoning. It may cause permanent impairment of the wind, by the formation of fibrous

bands attaching the lungs to the side of the chest, by compression of the lung through the contraction of a newly-formed fibrous envelope, or by injury to the recurrent laryngeal nerve. In favorable cases an entire recovery may follow upon the absorption of all morbid products.

The pericardium or heart-sac is often involved in cases of pleurisy. All this is characterized by extreme tenderness of the chest behind the left elbow, a friction sound heard at the same point until effusion takes place, after which the heart-sounds appear more distant and indistinct. The action of the heart is often irregular throughout.

In other cases the lining membrane of the heart and its valves are the seat of disease, though usually as a complication of the rheumatic form of the affection. In this case there is irregularity of the force and intervals of the heart-beats, and the healthy heart-sounds are modified by sighing, hissing, or purring murmurs, coincident with the first or second sound of the heart-beat according to the particular valve diseased. There is breathlessness and tendency to dropsical effusions, coldness and weakness of the limbs, and a liability to faint on slight exertion. Clots of blood sometimes form on the diseased valves, or even independently of their disease in very impure conditions of the circulating fluid and weakness of the circulation, and give rise to the same class of symptoms or aggravate those already in existence. In all such cases there is great liability to sudden death, and this liability may last indefinitely even after apparent recovery.

With abdominal complications. - There is almost always some implication of the digestive organs, as evinced by the coated appearance of the dung, the yellowness of the mucous membranes, and the dangerous susceptibility to purgatives. So small a dose as two drachms of Barbados aloes has been known to prove fatal to the horse in influenza. Many cases during the recent epizootic merged into a muco-enteritis after the nasal catarrh had been already established, and in some visitations this implication of the digestive organs has been rather the rule than the exception, and the disease has been accordingly termed bilious fever, typhoid fever, gastric fever, &c.

In such cases, however, the disease usually makes its appearance as the simple catarrhal affection, and it is only after the discharge from the nose has been established that the muco-enteritis sets in, and by the violence of its manifestations virtually supersedes the original disease.

There is great torpor and stupor, and tension of the abdominal walls, which are generally tender to the touch, but especially at points occupied by the organs particularly implicated. Thus with derangement of the liver, and the more purely bilious symptoms, the tenderness is mainly over the short ribs on the right side, while with intestinal disease it is more uniformly distributed over the abdomen. The loins are insensible to pinching; there are colicky pains, with frequent looking round to the flank, or uneasy movements of the hind limbs, ardent thirst, clammy, slimy mouth, a coated or furred condition of the tongue, and unusual yellowness of the visible mucous membranes and of the urine. The urine is sometimes reddish or bloody, and passed with considerable effort. The pulse is small and weak, but with a quick beat and variable in number; the breathing is often quick and catching, as in pleurisy; the cough is weak and painful; the bowels show a tendency to constipation; the pellets of dung are thickly coated with mucus; and the membrane of the gut exposed in passing it of a dull red color. The anus will sometimes remain constantly open, air being alternately drawn into the gut and expelled. The animal strains frequently, but passes only a few pellets of dung at a time.

Improvement is often manifested in connection with a fever action of the skin, kidneys, or

bowels, the torpor and prostration disappear, the appetite and strength are increased, and a prompt recovery may be expected.

In fatal cases the torpor and prostration are augmented; the breath becomes fetid; the anus more puffy, red, and with a greater tendency to remain open; the dung passed often and in small quantities, soft and mixed with glairy reddish or bloody matter. The urine is scanty, high-colored, slimy, sometimes thick and gelatinous, fetid, and even bloody. The pulse becomes more and more rapid and weak, the eyes sunken, the surface and extremities become cold, the hairs are easily detached, and the stupor and debility extreme.

Complication in the joints, muscles, and connective tissue. - Rheumatio manifestations. – The stiffness of the body and limbs, and the general soreness in many cases, even at the outset, show how commonly the white fibrous tissues of the joints and muscles are implicated. It is only requisite that these symptoms should be unusually prominent to make the rheumatic feature of the complaint its characteristic one; and this has often been the case to a large extent in the colder latitudes, such as Northern Germany, Denmark, and Scotland. It has been a frequent complication in New York during the influenza of 1872. Cases of this kind mostly begin by showing the symptoms of the simple catarrhal malady, and often after this has made some progress in a regular, and it may be exceptionally mild form, there suddenly appears painful inflammation, with more or less infiltration and swelling of the fibrous sheaths of the muscles and tendons and of the ligaments of joints. There may be merely some swelling and tenderness of certain muscles of the face, neck, back, or limbs, or there may be thickening and shortening of the tendons and ligaments leading to distortion, and knuckling over at the knees and fetlocks, or liquid effusions may take place into the joint capsules, resulting in puffy, elastic swellings in different parts; the bones even may be involved in the disorder, or, worse still, the fibrous structures and valves of the heart. Dropsical effusions take place in some such cases from the impairment of the local nutrition processes, and weakness of the circulation, and even at times from the implication of the heart. Though the majority of rheumatic patients will entirely recover with proper care, yet a certain proportion only do so with stiffened limbs and joints, or with incurable disease of the heart, which subjects them to constant danger of fainting and sudden death.

Dropsical complications. - As already noticed, dropsical effusions sometimes ensue from pre-existing disease of the heart or suppressed secretion of the kidneys. In other cases they appear due to extreme weakness of the circulation and nutritive processes, and a watery or very impure state of the blood, the result of protracted or severe illness, unwholesome conditions of life, overwork at too early a stage of convalescence, and the like. Such œdematous swellings of the limbs, beneath the chest and belly, and in the lower part of the head, have repeatedly occurred as a prominent feature of the influenza in England, and notably in 1751, and July, 1845, apparently in connection with the extremely variable and unwholesome weather which prevailed. The dropsical cases in 1872 have been virtually unknown in this country, having been confined to Buffalo, Rochester, New York, Philadelphia, Washington, and other large cities, where the patients were in many cases condemned to draw overloaded street-cars, or other vehicles, as soon as the nasal discharge had been freely established and the fever had begun to decline; or when they were confined to damp, close, reeking, unventilated, often underground buildings; or where they had been worn out by injudicious and exhausting treatment.

These dropsies are always dangerous, implying as they do extreme exhaustion and prostration of the vital powers, saturation of the blood with waste and hurtful elements, the product

of the extensive waste of the body or complications on the part of the heart or kidneys.

Nervous complications. - The extreme muscular weakness and the occasional semi-comatose condition of the patient imply a profound prostration of the nervous centers, a condition which is, however, present to a variable extent in nearly all specific fevers. This has sometimes in the recent epizootic amounted to twitching of the muscles of the face, neck, body, or limbs, and has been known to result in delirium, and even partial or complete loss of control over the limbs. My friend and former collegian, Mr. Murray, of Detroit, has met with but three cases of extreme nervous disorder out of five hundred patients during the recent epizootic. Two of these he diagnosed as serous effusion into one ventricle of the brain, and one was a case of complete *hemiplegia.*

Inflamed eyes as a complication. - Rutty informs us that this was an almost constant accompaniment of the influenza in Ireland in 1760, and that many of the horses were left permanently blind. In that of 1845, in England, the affection of the eyes was again a prominent feature. Few cases lasted over a week, but the ophthalmia often persisted long after all other symptoms had passed away. In nearly all epizootics there is a slight implication of these organs evinced by the redness of the mucous membrane, of the lids, and the escape of tears over the face. But when the ophthalmia becomes an important feature there is excessive swelling, of the lids, a profuse purulent discharge from the inner corner of the eye, opacity of the transparent cornea, with or without a painful sensitiveness to light. In bad cases it results in permanent cloudiness of the cornea, or cataract, according to the parts involved.

Further sequelae. - In overworked or mismanaged horses other affections will sometimes wind up the malady. When the system is greatly depressed, when the vitality of the blood and tissues is greatly impaired by the presence of the fever-poison, when the vital fluid is loaded with the vast products of the rapid tissue changes due to the fever, and to over-exertion on the part of animals utterly unfit for it; when the elimination of these effete matters is almost suspended by the impaired functions of the great excretory organs, such as the lungs, liver, bowels, kidneys, and skin, there is liable to supervene the state known to English veterinarians as *purpura haemorrhagica.* In this affection there is disorganization and breaking down of the blood particles, and extravasation of the liquid elements of the blood, and in some cases of the coloring elements as well, into the tissues surrounding the blood-vessels. Blood seems to sweat from the swellings in the skin, or from the mucous membrane, and flows from the nose, the intestines, or the urinary passages. The swellings are circumscribed and not situated, like those of dropsy, on the more dependent parts of the body; if they involve the head the whole organ may be engorged until it becomes impossible for the animal to open his mouth or eyelids, or even to breathe. If less extensive, and consisting merely of a circumscribed serous infiltration, the swellings may shift about from day to day, disappearing only from one place to re-appear in another. The blood in such cases is found to contain much free hæmatim, or coloring matter, and fragments of broken-up; red globules; it coagulates imperfectly and loosely, or not at all, but remains as a dark, tarry-looking mass, and before death contains numerous staff-shaped bodies, or *bacteria,* resembling those found in decomposing animal fluids. This affection, which existed to some extent as a sequel of the recent influenza in Boston, New York, and other cities, usually proves fatal in fifty per cent of animals attacked. I know of but two cases of this complication in Tompkins County, New York, during the recent visitation. One occurred early as the result of heroic treatment; the other after partial convalescence from hard work and exposure.

Glanders and farcy have been among. the results of the epizootic of 1872, and, like *purpura haemorrhagica,* are always liable to break out when the strength is seriously reduced and the blood impoverished and loaded with impurity, in connection with protracted and exhausting disease, impure air, and generally debilitating treatment. Whether these diseases arose *de novo,* or from preserved germs left over from the numerous cases of glanders in New York a few years ago, it will be no easy matter to decide.

The epizootic of 1872, in America, has followed mainly the simple catarrhal type, and has been by no means a fatal affection, the mortality ranging from 1 in 300 in many country districts, to 3 or 5 per cent in some towns. Yet in a number of instances the various other complications have been noticed, with the exception, perhaps, of the *ophthalmic* ones.

Post-mortem appearances. - These are mainly seen in the respiratory organs. In fatal cases the cavities of the nose, the nasal sinuses, and, still more so, the parts about the throat-fauces, pharynx, and larynx usually have their mucous membrane much tensified, livid, and softened with dark or greenish metallic tints, implying the existence of gangrene. Ulcers or masses of thick tenacious mucus are sometimes present, and the latter have been sometimes mistaken for false membranes. The guttural pouches, and the submaxillary and guttural lymphatic glands are sometimes congested and swollen.

The deep-red hue, and the puffy, softened condition of the mucous membrane are continued throughout the trachea and, above all, in the bronchia, even to their smallest divisions, and these are more or less completely filled with a frothy mucus.

In cases of unusual virulence and early fatality, or long standing, and with a very, impure condition of the blood, the pleuræ (covering of the lungs) and the heart-sac are spotted with petechiæ or blood extravasations, and usually contain effusions of a deep-red bloody aspect, containing little fibrine, and with a very little tendency to coagulation. False membranes in these cavities are far from numerous, and adhesions between the lungs and the sides of the chest rare, except as the result of a pleurisy after the primary disease has subsided. The surface of the lung and the substance of any false membranes have a tendency to a dark-red hue.

When the lungs have been implicated these are commonly found in a state of dropsical infiltration, apoplexy, or gangrene in patches, while hepatization is rare in the early stages, though frequent enough if the disease is prolonged.

The dropsical portion of the lung does not collapse like the healthy part; does not crepitate or crackle on pressure. The pressure of the finger leaves a depression, as in a dropsical limb; it seems solid, sinks in water, and gives exit to much frothy matter when pressed. This is sometimes dependent on disease of the valves of the heart, but in other cases on the altered state of the blood. The pulmonary apoplexy consists in the infiltration of blood into the lung tissue in circumscribed, rounded, or angular patches, and even sometimes in a diffuse manner. These patches are firm to the touch, black with a slight tinge of red, and rise abruptly to a variable height above the level of the surrounding healthy lung. Like dropsy, it is most frequent toward the lower borders of the lungs, and, like that, arises from disease of the valves of the left side of the heart, or the altered state of the blood, but at times also from a diseased and softened state of the pulmonary blood-vessels, which predisposes them to give way.

Gangrene of the lung is fortunately rare. It is recognized by the bloodless, hardened appearance of the tissue, with bluish, greenish, or other metallic tints, or it may be deliquescent, and with a most repulsive odor. Hepatization is seen mainly about the roots of the lungs or near their lower border. In its early stages the lung is consolidated by a semi-solid infiltration,

which drains out when it is cut in thin slices; later it has a firm, dry, granular appearance, like the substance of liver, easily gives way to the pressure of the finger, does not crepitate nor collapse, and sinks in water. It is mainly of a dull deep-red color, varying to a violet. If suppuration has ensued, this changes to a gray color, and drops of pus exude from the freshly-cut surface. The heart is blanched and softened, and sometimes contains clots firm enough and sufficiently adherent to the valves to imply their existence during life. In a recent post-mortem examination of a horse which had suffered from the most agonizing difficulty of breathing for thirty-six hours before death, I found the right ventricle filled with a large clot, very firmly adherent to the tricuspid valve, and composed of superimposed layers, decreasing in firmness from the valves outward. There was some infiltration around the roots of the lungs, but by no means sufficient to account for the dyspnœa. These clots are often divided into a yellow buffed and a deep-red portion, though at other times and in the more malignant cases they are comparatively diffluent, black, and tarry. The valves of the heart are sometimes found thickened, rough and contracted, as the result of inflammation, but chiefly in rheumatic cases.

In the digestive organs the right sac of the stomach and the small intestines are unnaturally vascular, and marked with numerous spots of blood extravasation or staining. The glands are often enlarged, the epithelium is easily detached, and slight punctiform erosions are sometimes met with, but no distinct ulceration. Petechiæ may also be present on the folds of the peritoneum. The intestinal contents are often mingled with excess of mucus, or even colored with blood. The liver is often enlarged, softened, and friable, and of a pale-yellow hue, with brownish spots. In all cases in which the changes in the blood have been extensive, and, above all, in cases which have merged into *purpura haemorrhagica,* the spleen is engorged with blood and increased in size and weight. The kidneys are usually healthy in aspect, though in some instances enlarged and softened.

The brain is usually found slightly congested, and effusions have been met with in the ventricles, in the arachnoid and sub-arachnoid space. So constant was this lesion during the epizootic of 1836 in London, that Charles Clark concluded, after extensive dissections of dead horses, that this was the primary seat of the disease, and that all other manifestations were simply complications. To these may be added the liquid effusions beneath the skin and between the muscles and tendons in dropsical cases, the inflammations, thickening and redness of tendons and their sheaths, and of joints with the puffy swelling of joints, and other synovial sacs in rheumatic subjects, and the blood-staining of the inner surface of the skin, the gelatinous exudations and the accumulations of blood in the limbs and beneath the skin in various parts characteristic of *purpura haemorrhagica*.

CAUSES OF THE INFLUENZA. - Unlike the majority of former epidemics whose origin has been obscure, this appears to have sprung into existence in the center of the North American continent, and in a distinct locality, which can be definitely pointed out. It has spread rapidly and steadily in nearly every direction, from this as a center, and, thanks to facilities afforded by railroads and telegraphs, its course has been traceable with ease. The following is intended as a contribution toward securing the lessons which may be learned from the visitation.

The old doctrine of an epidemic constitution of the atmosphere has of late years been gradually waning, as cholera, small-pox, typhoid fever, and other epidemics and epizootics have been traced to more tangible causes, and placed more under human control. More than any other epidemic malady, perhaps, has influenza retained its claim on an atmospheric causation.

It has been described as falling simultaneously on all parts of a given district or country, as breaking out in islands a considerable distance from the shore, and without having had any communication with the mainland, and as having attacked the crews of ships in mid-ocean after they had been twenty days at sea. No wonder that we should have had all imaginable general conditions of the earth, water, and air invoked to explain its occurrence; that at one time it has been attributed to the lowness and dampness of a locality, at another to the height, exposure, and coldness; at a third to crowding of population with the resulting impurities of soil, water, and air; in a fourth case to the vicissitudes of weather in late spring, autumn, or winter, or of some unusually variable season; to a persistent low temperature, or sudden variation of temperature; to the prevalence of damps, acrid or fetid fogs, and mists; to excessive rain-fall and unusual humidity of the atmosphere; to an unusually high or low density of the atmosphere; to an excess of ozone in the air; to the telluric emanations attendant on great earthquakes and volcanic eruptions, or to a modified condition of the atmospheric electricity.

The epizootic of 1872 affords but the slenderest appearance of support to any of these hypotheses. Neither soil nor elevation has materially affected it. The prevalence and mortality have been almost the same in the mountains of Vermont and New Hampshire as in the flat malarious sea-coast of New Jersey, Maryland, and Virginia. The district where it originated, according to the report of Professor A. Smith, is very variable. In the township of York, near Mimicu, Canada West, it is partly "heavy clay and partly a sandy soil, intersected with swamps. In another part of the township of York the soil is formed of clay, intermixed with sand, and the subsoil generally is not porous. In Scarborough and Markham the land is good and the farms well cultivated, the buildings, stables, &c., generally comfortable and well ventilated, and the horses well fed, and otherwise carefully attended to."

The temperature has not exerted any marked influence. The disease has been general wherever it has reached; and the mortality bas averaged 1 per cent or a little over. Indeed, in some cases the comparison has been altogether in favor of the more northern and colder localities. Thus in Fulton County, Georgia, it is reported as universal, and the mortality up to the date of the report had been 1 per cent; in Dodge County, Wisconsin, on the other hand, although, after the outbreak of the affection, there had been a sudden transition in a single night from a pleasant Indian summer to the rigorous and persistent cold of winter - the thermometer sometimes marking 8^{o} below zero - yet the losses in the country districts are estimated at 1 in 300.

Overcrowding, its concomitants of hot, damp, vitiated air, has unquestionably been a main cause of the severity and complications of the disease in large cities, the pneumonias, pleurisies, *purpura haemorraghias*, &c., but the malignancy of all specific febrile diseases, occurring with such unwholesome surroundings, forbids that we should attach any importance to these in estimating the causes of this particular disorder. Influenza in man shows a similar malignancy and fatality in unwholesome localities, and in overcrowded portions of cities where hygienic arrangements are imperfect. The observations of Pearson, Parks, Baker, Gray, and the English registrar-general have sufficiently established this fact. And equine influenza, when more circumscribed than at present, has often confined. its ravages to exposed stables, opened and swept by draughts of cold air, or closed and without ventilation, light, or drainage, but with an impure, damp, and stifling atmosphere. Yet such conditions can only retard or prevent the elimination effete matter from the system, favor the introduction of the deleterious products of the composition in animal and vegetable matters, saturate blood with impurities,

and by impairing or suspending nutrition and other important functions lay the system open to the access of disease. But while they facilitate the development and increase the severity of all zymotic maladies, they do not determine which specific affection shall be developed in a particular case. That is determined by the prevalence of influenza, glanders, or other specific disorder in the locality at the time. And it is noticeable in this connection that the equine influenza of 1872 did not originate in a crowded city, as is generally supposed.

Sudden changes of weather and temperature. - Nasal and bronchial catarrhs often prevail extensively among horses, as among men, in connection with sudden and extreme variations of temperature, and especially in spring and autumn. These are liable to be confounded with influenza, and hence the idea that this disease is but a simple result of such climatic vicissitudes. In the case of the horse the changeable seasons are often aggravated by the weakness and susceptibility of the system in connection with the spring and autumn changes of coat, the transition from the hot stable to the cool field, or from the clear atmosphere of the pasture to the close, hot, impure air of the stable, the changes from green to dry food, or *vice versa,* and the substitution of work for idleness, or the reverse. That the effect of sudden changes of temperature is very severe on the animal system which has not become habituated to the new condition of life by a gradual transition from one to the other, is well shown in W. Edwards's experiments on cold-blooded animals. Though subjected to a very low temperature in winter the heat of their bodies declined barely four-tenths of a degree, whereas exposure to a cold temperature in summer insured a depression of body-heat to the extent of 3° and even 6° Cent. So it is with warm-blooded animals transferred from a warm to a cold climate. The French cavalry horses, sent from the shores of the Mediterranean to the northern parts of the country, suffer to a great extent from catarrhal and pulmonary affections. But such catarrhal attacks do not spread as an epizootic, nor extend from the newly-arrived horses to those which are permanent residents. Catarrhal symptoms exist, indeed, but the *contagium* which secures an extension and general prevalence of the malady is wanting. Such vicissitudes, therefore, operate like other unwholesome conditions of life; they predispose the system to the disease, or even increase its severity, but they cannot apparently generate the morbid poison.