must be not only useless but pernicious, since the invariable effect of quarantine as hitherto practised in all countries has been the congregation and confinement of the sick and of those who, though not actually sick, are suspected to have in them the seeds of disease, requiring only a few days or hours for their development,—the congregation and confinement of such persons in a limited space, often in a filthy ship and an unhealthy locality, and always under circumstances calculated to excite apprehension and alarm,—conditions in the highest degree favourable to the generation and spread of disease: it follows that quarantine, instead of guarding against and preventing disease, fosters and concentrates it, and places it under conditions the most favourable that can be devised for its general extension; and therefore must not only fail to accomplish its object, but tend to produce the very calamity which it endeavours to prevent." (p. 61.)

Now this description of the practice of quarantine "in all countries," after having visited the principal European lazarettos in the Mediterranean, I do not hesitate to state, is totally and entirely contrary to the truth. In no lazaretto for many years past have patients been congregated or confined in a limited space. On the contrary, all suspicious cases of sickness which occur on board ship are removed on shore, are placed in separate and well-ventilated rooms, and attendants are placed there with them. This is the invariable custom; and therefore the conclusion that quarantine fosters and concentrates disease is unfounded and untrue. I have been on three separate occasions in charge of small-pox patients in a lazaretto, for periods ranging from sixteen to twenty-one days. In every case the patients were removed from the ships as soon as they arrived, they were sent on shore to separate and well-ventilated rooms, and I, with nurses, was kept with them in quarantine until all danger of propagating the disease had passed off. Now, can any reasonable being doubt that in this way small-pox was prevented from spreading among other men on board the ships; or that if these precautions had not been taken, the seamen, and through them the whole neighbourhood might have suffered severely for a long period? The ill effects of the neglect of these precautions was most strongly evinced in 1830, when the small-pox was distinctly proved to have spread from the Naval Hospital at Malta to the home of the person who washed the patient's linen, and then over the greater part of the island. It extended itself rapidly, and did not cease until the following year, 10,351 persons having been attacked, of whom 1503 died. It was proved to have been imported from Greece in H.M.S. *Asia*, there being no small-pox in the island before the arrival of this ship; and there can be little doubt that the subsequent immunity of the island has been secured by the quarantine regulations, which were neglected in this unfortunate instance with the effect of destroying and disfiguring so many unfortunate persons.* And yet we are nauseated by philanthropical homilies upon the *inhumanity* of quarantine, and the reporters coolly tell us that the system places disease under conditions the most favourable that can be devised for its general extension. I repeat emphatically that in all the European lazarettos I have visited, and this includes nearly all those in the Mediterranean, quarantine regulations are carried out in exactly the opposite manner to that stated in the above paragraph. The sick are not confined in ships, but are immediately removed from the ships to the lazarettos; and these are not in unhealthy localities, but on islands or promontories fully exposed to the sea breezes. The sick are not congregated together, but are invariably separated from each other; and attendants are placed with them, who must undergo the same period of quarantine, and who know that their own safety depends on the cleanliness and thorough ventilation the apartments and clothing of the sick.

I have trespassed already too long upon the time of the Society, but I cannot conclude without protesting against

the absurdity of those who talk of the *substitution* of quarantine by sanitary measures, as if quarantine when rationally practised was not a sanitary measure of the very first importance. I contend that those who most firmly believe in the good that quarantine can do and has done, but at the same time are anxious to remove its inconsistencies and to reduce it to a system based on science and experience, those, I say, are the men who are the most earnest and practical supporters of other sanitary measures. They fully recognise the importance of drainage, ventilation, and cleanliness; the necessity for improving the dwellings of the poor, and labouring hard to raise the social condition of the people; but they say, at the same time, do not neglect another great means of preserving health; do not, in case of contagious epidemics, hesitate to separate the sick from the healthy; not by crowding the sick together, but by separating them from each other in well ventilated institutions, and thus prevent them from communicating the disease under which they labour to the rest of the community. So far from this exciting alarm, as the opponents of quarantine assert, I maintain that it is the very best mode of tranquillising the public. Let us suppose ourselves in a sea port or an island, and that a ship arrived with plague on board, I would ask, is the population of that place likely to be more alarmed by hearing that the crew are at liberty to wander through the town or island, or that the sick have been confined in one part of a lazaretto, and the healthy in another; that the ship has been cleansed, and that all persons engaged about her have been kept under observation until all danger of the spreading the disease has ceased?

Common sense can give but one answer to this. Yet this is the system which is condemned by the author of the paper which has led to this discussion, because it has been imperfectly and inconsistently carried out. I trust, however, that this Society will recognise the real good it has effected, even under the disadvantage of all these imperfections and inconsistencies, and will continue (while assisting us to obtain every necessary reform) to oppose the abolition of an institution which has infinitely overbalanced the very great and unnecessary loss and inconvenience its operation has led to, by repeatedly preventing the introduction of contagious diseases into healthy communities, and by checking their progress *after* introduction,—in both ways effecting an incalculable saving of human life, thereby adding another to the vast boons which medicine has conferred upon mankind.

(30, Brook Street, August 1854.

CLINICAL NOTES ON CHOLERA.

By W. LAUDER LINDSAY, M.D., late Resident Physician of the Surgeon Square Cholera Hospital, Edinburgh.

[Continued from page 676.]

POST MORTEM MOVEMENTS AND ELEVATION OF TEMPERATURE IN CHOLERA PATIENTS.

Two classes of phenomena have been frequently noticed and described as occurring immediately after deaths during the collapse stage of the disease, viz.: tremulous and other movements of many of the smaller muscles of the body, and a sudden and general rise in the temperature of the surface. Specimens of the former I have distinctly seen in several cases; the latter I have by no means noticed to the same extent that it has been observed by others. The movements referred to consist in a slow and gradual flexion or extension, or both alternated; or in tremors or spasmodic sudden jerks, of various degrees of intensity, of the muscles of the jaws, face, feet, and hands, and sometimes, though seldom, of the limbs and trunk. I have frequently noticed a quivering of the lips, varying in intensity or duration; tremors or jerks of the masseters, or contractions so forcible as to produce a churning or grinding of the teeth; a lateral sawing motion of the lower jaw, or a firm clenching together of the jaws. In some of the latter cases, the noise produced by the

* All the details of these facts may be found in Dr. Davy's work upon the *Ionian Islands and Malta*.

grinding of the teeth was sufficiently loud to be heard at some distance. At other times, there has been a series of up and down movements of the jaws, as if the corpse were gasping convulsively for breath. If the facial muscles were affected, there were slight twitchings at the angles of the mouth, or the features assumed various expressions, *e.g.*, the *risus Sardonius*, gradually lapsing into the utmost placidity of countenance; if the platysmæ myoides were chiefly affected, we saw tremors or twitchings of the neck; if the sterno-mastoid and other muscles connecting the upper part of the thorax with the hyoid bone and thyroid cartilage, and with the vertebræ, there were produced wry-neck, doubling of the chin on the manubrium sterni, or a bending of the neck to one or other shoulder; sometimes the appearance resembled that produced by the cicatrization of an extensive burn in the neck: if the thoracic muscles and diaphragm contracted, we saw apparently feeble attempts at respiration or stifled sobs; if the pectorales and muscles of the shoulder, one or both arms were drawn closely to the side or slightly flexed on the abdomen or thorax, or there was a slight elevation of the shoulder towards the head. In a great many cases, the small muscles of the hands and feet, and fingers and toes, particularly the extensors and flexors of the toes, were the seat of the *post mortem* contractions; in them the movements generally consisted in slow flexion or extension. In very few cases were the muscles of the leg or thigh so affected as to produce motion or change of posture. Of all the muscles of the body those most frequently the seat of tremulous movements, which were the most common, were the muscles of the lower jaw and toes; the next in point of frequency being those of fingers, hand, feet and face. Flexion of the phalanges of the fingers was sometimes accompanied by very distinct crackling sounds as if the joints were being forcibly dislocated. In conjunction with this muscular contractility, it was frequently observed that the limbs and muscles were for some time after death very soft, flaccid, and pliant, and that the rigor mortis was long of supervening.

Connected with this subject I applied galvanism, through the medium of Kemp's galvano-magnetic coil machine, in a few cases, for the purpose of ascertaining the degree and duration of this muscular contractility and their relation to the fatal period of the disease; what muscles exhibited the maximum and minimum of this property; whether the same muscles found most contractile under the stimulus of galvanism were the seat of the maximum spontaneous *post mortem* movements and similar points. The result of the few experiments made was—

I. That within periods, varying in different cases from a few minutes to nearly an hour after death, many muscles were readily stimulated to contraction by the galvanic current, and that beyond this point or period they rapidly lost this contractile power.

II. That the smaller muscles were most susceptible, and particularly those of the lower jaw, face, neck, fingers and toes.

III. That the contractility varied in intensity according to the length of the period that had elapsed since death, the fatal stage and type of the disease, and other circumstances; and that it was very readily exhibited in the masseters, which could be made to close the jaws most firmly, or produce a grinding of the teeth audible at a short distance.

IV. That the phenomenon has no fixed relation to the fatal period of the disease, since it has been noticed equally well marked after deaths during the typhoid, as during the collapse stage.

V. That, in many cases, this use of the galvanic battery affected the subsequent rigor mortis, but not uniformly as to time or degree.

VI. That the facial muscles retained their contractility longer than those of any other part of the body.

By placing one handle of the wire connected with the battery on one side of the neck and the other on the back of the forearm or hand, I could frequently cause the arm to be flexed and thrown in front of the abdomen, thorax, or face, as if to defend these parts from anticipated injury. By

acting in a similar way on the masseters, levators and depressors of the angles of the mouth, occipito-frontalis, dilators and contractors of the nares, etc., one could produce an infinitude of changes of feature and expression; *e.g.*, the *risus Sardonius*, appearances indicative of pain or pleasure, contentment or the reverse, etc. By acting again on the muscles of the neck, another series of effects were produced; in fact, according as the current is directed, the effects are endless. I have caused many times in succession a hand and arm to be suddenly raised in front of the face as if to guard it from a blow, and have produced jerking or spasmodic movements in one or both lower limbs, similar to reflex action produced by tickling the sole of the foot. On examining a body within one or two hours after death, I more than once noticed that a peculiar position had, in the interval of my visits and experiments, been assumed by the arms or legs, proving that there must have been movements, though they were not observed by me. For instance, the arms were sometimes flexed across the thorax with the hands clasped loosely, in mere contact or approximation, as if in the attitude of prayer. In such cases, if the arms were forced into an extended position by the side of the body, they immediately resiled, and reassumed the flexed condition.

Coincident with these *post mortem* muscular movements and rise of temperature, it often happened that the colour of the surface underwent a marked change. If prior to death, there existed any tendency to, or marked degree of cyanosis or livor, general or partial, or a bluish or purplish tinge, this gradually disappeared and the body acquired the natural colour of health or a cadaveric pallor. In some cases, this change was permanent; in others, it was followed by the reappearance of livid mottling or general cyanosis in various degrees. Though, in some cases, there was a natural co-existence of these phenomena in the same case, there is no necessary connexion between them; for one alone may be present, or they may all be absent. Neither is there any fixed relation between them and the fatal period, type, duration or intensity of the cholera; for they are not peculiar to the collapse stage, and may not be exhibited during any stage of the disease.

The following cases will probably place these facts in a clearer and more comprehensive light.

CASE I. H. H., a woman, aged 44, died in deep collapse nine hours after admission. There was considerable dingy livor and livid mottling of the arms and trunk, with a blueness of the hands, face, and lips; this tendency to cyanosis, though much less distinct than is generally described by authors, was better marked than in any others I have seen. Cramps had been very severe and incessant during life; at first they were chiefly confined to the gastrocnemii, which were felt to contract into large hard knots, but latterly the patient complained of their extending to the stomach and heart. Shortly prior to death, the surface became rapidly cool, notwithstanding the exhibition of stimulants and application of external heat.

Immediately after death, the temperature gradually rose, and one hour and a half afterwards the surface was still quite warm, the limbs quite pliant, and the muscles felt soft, flaccid, and doughy. For a short time after death, there were observed quasi-respiratory acts, consisting of a convulsive gasping of the mouth, and alternate contraction and relaxation of the thoracic cavity, by the muscles of the neck and thorax being affected; there were also tremors of the masseters and neighbouring muscles of the face. At the same time, the lividity of the surface was breaking up into mottled patches and slowly disappearing. About half an hour after death, the toes of both feet were slowly extended, from a flexed, contracted condition, by a series of slow tremulous jerks. This motion was best observed in the great toe of the left foot, which was alternately flexed and extended slowly, for upwards of ten minutes or quarter of an hour.

At the *sectio cadaveris* next day, the rigor mortis was found pretty strong. The lips and extremities of the fingers remained livid, and the groin, lower part of the abdomen, and thighs had a dingy, leaden tinge.

CASE II. A. S., a woman, aged 40, died in deep collapse eighteen hours and a half after admission.

Prior to death, there were severe and constantly repeated spasms of the gastrocnemii and muscles of the toes, legs and thighs, gradually extending to those of the abdomen. There were also convulsive closure of the jaws and grinding of the teeth—so forcible as to be perceptible to the ear at some distance. In connexion with this condition of the muscles of the throat and mouth, the patient could scarcely swallow the smallest quantity of fluid without symptoms of suffocation. The fingers also were convulsively clenched. The lips and feet were the only parts of the body distinctly livid; some hours before dissolution, the face became dusky purple, and the lips almost like ink, while the dull, leaden colour of the feet and hands was much deepened. Five hours before death, the breath had a temperature of 65°, the lips of 78°, and the hands, clenched round the thermometer bulb, of 80°.

Immediately after death, the upper parts of the body, which had been much exposed by the patient, were cold; but the trunk and lower extremities were very hot, moist, and covered with a copious, unctuous sweat. About fifteen minutes after death, there were four or five successive up and down movements of the lower jaw, resembling yawning, without any grinding of the teeth or lateral rubbing motion. At the same time there was a slight movement in the left leg, accompanied by a crackling noise in the left ankle-joint, as if its component bones were being forcibly dislocated. The surface of the body gradually became cool, and, when removed to the dead-house one hour and a half after death, it was nearly quite cold. The slight degree of irregularly distributed lividity had disappeared, and the body had reassumed its natural colour, with the exception that the finger points were corrugated and bluish, the arms marked by dingy purple mottling, and the lips, nose, and lower eyelids livid.

At the autopsy next day, the rigor mortis was very strong, especially on the left side, where the cramps had been most severe during life, and the *post mortem* movements chiefly exhibited. There was no distinct livor in any part of the body, and the face possessed nearly its natural colour and fullness.

CASE III. M. F., a woman, aged 40, died in the typhoid stage, on the third day after admission in collapse.

The movements consisted of an up and down motion of the lower jaw; convulsive tremors of the neck and thorax; a to and fro motion of the right arm, and slight alternate flexion and extension of the fingers. Kemp's galvanic-magnetic coil machine was applied about twenty minutes after death. Almost all the muscles were found contractile, though to very different extents. Those most susceptible of the stimulus were the muscles of the face, neck, and arms, and the diaphragm. I was enabled to produce very readily flexion of the fingers and closure of the hand: also flexion of the arms on the thorax, or I could raise them to the level of the mouth or nose; forcible closure of the mouth and grinding of the teeth; elevation, depression or retraction of the angles of the mouth; elevation of the shoulder; bending of the neck to either side, or upon the sternum in front; contraction of the thorax; various movements of the feet and legs; movements resembling yawning, respiration, suffocation, etc.

There were also spontaneous flexion-movements of the toes; but the feet were only moved very slightly in a lateral direction. The muscles of the leg and thigh were caused to contract slightly but not to such a degree as to flex or extend the limb. Those of the abdomen and back were similarly affected. Twenty minutes after death, the body was quite warm, the muscles soft and flaccid, and the limbs could be made to assume any position. Forty minutes after death, there was still a considerable amount of muscular irritability; one hour afterwards, it was nearly gone, and the body was rapidly losing its heat. In two hours, the battery had no effect on the greater number of the muscles, and the body was cold. During the second hour there must have been spontaneous muscular movements in the arms, which

had been left extended by the side of the corpse and were now found flexed on the thorax in the attitude of prayer.

At the *post mortem* examination next day, there was considerable livor or livid mottling of the neck, over the sternum, the sides and posterior aspect of the thorax and the right shoulder and arm. Rigor mortis was very slight. The jaws, which had been open for some hours after death, were now firmly closed.

CASE IV. J. McG., a man, aged 45, died in collapse about nine hours after admission.

During life, there was a dingy purplish hue of the face, neck and extremities; shortly before death this was greatly increased. About two hours before the fatal issue, this cyanotic condition disappeared, and the body resumed its natural colour.

Immediately after death, there were two or three up and down movements of the lower jaw, which were repeated at short intervals, gradually becoming less till they disappeared; slight jerking of the arms; a churning or crackling sound of the metacarpo-phalangeal and phalangeal joints of the right hand; and tremors of the muscles of the thorax, neck, jaws, and toes. The body was quite warm, and covered by a copious clammy sweat.

On sending a current of galvanism through them, the muscles were found exceedingly contractile, and especially the masseters and facials, pectorals and diaphragm. Those of the forearm and arm, and of the toes, legs, abdomen, and chest, were less so in the order in which they have been mentioned. I was able to produce the *risus Sardonius*; closure of the jaws; convulsive quivering of the lips; appearances of anger, pain, pleasure, placidity, and contentment; rapid contractions of the diaphragm; clenching of the fist on the handles of the battery wires; beating of the chest or abdomen by the hand; convulsive heavings of the chest; slow contractions of the toes; but I could affect in a similar way none of the muscles of the leg or thigh, etc. In one hour and a half after death, the muscular contractility was exhausted, and the body was quite cold, though lying before a strong fire.

When examined next day, the rigor mortis was very strong. With the exception of slight livid mottling of the arms, and livor of the depending parts of the body, there was no cyanosis of the surface.

CASE V. I. M., a woman, aged 55, died in the typhoid stage, three days after seizure.

During life, the cramps had been slight, and confined to the legs. The *post mortem* movements were also slight, consisting of a hitching up of right shoulder, and transient tremors of the thoracic and abdominal muscles only on moving the body.

CASE VI. J. B., a woman, aged 53, died in deep collapse, three hours and a half after admission.

Kemp's machine was applied half an hour after death; and the facial and pectoral muscles, as well as those of the arms, were found very contractile. I could readily cause the arm to be flexed as high as the face. A slight up and down movement of the thorax was produced by acting on the diaphragm and intercostal muscles.

CASE VII. C. M., a woman, aged 34, died in the typhoid stage, on the fourth day after admission, in collapse.

About one hour before dissolution, the body became cold, especially the arms, from constant exposure. Immediately prior to, or at the moment of death, the arms, legs, and face assumed a transient dingy purplish colour. About a quarter of an hour afterwards, the temperature of the body had risen greatly, and an hour later, the surface continued warm, while the muscles were soft, flaccid, and pliant.

FACTS FOR CONTAGIONISTS, RELATIVE TO THE ARTIFICIAL AND ACCIDENTAL COMMUNICABILITY OF CHOLERA.

Without at present wishing to be understood as advocating or supporting the view which supposes cholera to be under all or certain circumstances contagious, preferring, in fact, to avoid at all entering on the *pros* and *cons* of this much vexed question, it may not be uninteresting to add to the vast mass of facts already accumulated, bearing more or

less directly on this subject, a few which have lately fallen under my own observation.

I have elsewhere published in detail* an account of a series of experiments on the artificial communicability of cholera to the dog and cat, which resulted in the simultaneous production of the disease in four animals, in two of which it proved rapidly fatal. It is unnecessary here to give more than a brief *résumé* of the general results at which I arrived. Seven dogs and a cat were subjected to experiment for periods varying from a few days to nearly two months: they were confined in a damp, close room, and fed on the evacuations of living cholera patients, and on the blood and various of the viscera removed after deaths in various stages of the disease. The substances more especially used as food were the stools, vomit, and urine, passed during life, and blood, muscles, cellular tissue and portions of viscera, etc., removed at the *post mortem* examination; they were supplied to the animals in all conditions of freshness and putridity, dilution and concentration. The result of this kind of food, in conjunction with deficient exercise and ventilation, was the production of a non-specific or simple diarrhoea, without apparently any marked deterioration of the general health. They were also exposed to, and caused to inhale the effluvia from the bodies of patients labouring under different stages of this disease, as collected on their body or bed-clothes. The result of this exposure to the concentrated virus of cholera—the predisposing causes of general disease having been previously produced and maintained—was an attack of the disease, and the death of two dogs with symptoms and pathological appearances exactly resembling those met with in man.

The principles on which I made these experiments were the following. By supplying directly to the intestinal canal the evacuations of cholera patients, with the histological and chemical characters of which I had previously made myself acquainted. I proposed to test the accuracy of various theories or views of the production and seat of cholera, which I had other reasons for suspecting were erroneous. These were—

I. *The fungus theory*: All the evacuations in question having been previously ascertained, by the microscope, to contain more or less of the so-called “cholera fungi” or “corpuscles”.

II. *The animalcular theory*: Some of the evacuations having been found teeming with minute vibrios, etc.

III. The view that the intestinal mucous membrane is the seat of origin of the disease and has been acted on by foreign organisms, vegetable or animal, introduced *ab extra*.

IV. The opinion that the blood contains, in its most virulent form, the poison of cholera.

From this series of experiments, I was, for various reasons, prepared to expect, and I obtained, negative results. By the means employed, I had concentrated on the animals all the more ordinary predisposing causes of disease in the human subject, and, in this respect, had placed them as nearly as possible on the same footing, with regard to the liability to be attacked by cholera, typhus, or similar diseases, as the lowest classes of the inhabitants of large cities, who are the most frequent victims thereof. These powerful predisposing circumstances were—

I. The habitual use of food poor or bad in quality, and deficient in quantity.

II. Ochlesia, or the overcrowding of animals in confined apartments.

III. Deficient exercise and oxygenation of the blood.

IV. Deficient ventilation and light.

V. The accumulation of filth, and the surcharging of the limited atmosphere with the noxious effluvia from their own bodies and evacuations, and from the evacuations of cholera patients.

VI. Moisture and a moderate degree of heat.

Having hereby produced in the animals a condition of body which rendered them liable to be readily affected by poisonous miasms of any kind, I next caused to be absorbed

by their lungs and skin the cholera poison, in the shape of the effluvia contained in the body linen and bed clothing of a patient who was admitted in collapse, and died in a few days thereafter, in the *acmé* of the consecutive fever. The effect was what I had been led to anticipate from combined observation and analogical reasoning, viz., that full exposure was followed by the development of the disease, in a rapidly fatal form, which closely resembled, if it was not identical with, the cholera of man. The animals were affected with severe and copious vomiting and purging of a thin, serous, icky, mucous fluid, slightly tinged with green feculent matter, and they appear (but this I cannot prove) to have suffered from severe cramps. A *post mortem* inspection of the bodies was made a few hours after death in both the animals. The points in which the pathological appearances most nearly coincided with, or resembled, those found in the human subject, were—

I. Hyperemia of the coats of the intestines, and of the abdominal viscera.

II. Ecchymosis of the interior of the stomach and intestines.

III. Hæmorrhagic exudation on the mucous membrane of the lower part of the intestines.

IV. *Psorenterie*, or enlargement of the solitary glands, and prominence of the Peyerian glands of the intestines.

V. Histological and chemical characters of the contents of the stomach and intestines.

VI. The presence of excess of flocculent icky mucus in the intestinal canal.

VII. Thickened, sodden, villous condition of the intestinal mucous membrane.

VIII. Thickened doughy feeling, with a gluey exudation on the exterior, of the small intestines.

IX. Discolorations of portions of the gut, resembling those met with in advanced dysentery.

X. Comparative absence of ordinary feculent matter in the intestinal canal.

XI. Mammillation of the interior of the stomach.

XII. Healthy condition of the bile.

XIII. Biliary reaction of the urine.

XIV. Condition of the blood.

XV. Dryness of the muscles and viscera.

These experiments were crude and imperfect, in consequence of my opportunities having been limited. Before receiving the conclusions, at which I was led to arrive, as worthy of being considered established facts, it will be necessary to have them repeated, and corroborated or corrected. In so doing, however, it will be necessary that the whole steps taken by myself be closely followed, otherwise I have no faith in the success of the result. Without having powerfully predisposed the animals in the way alluded to, I believe the exposure to the effluvia from the fomites would in all likelihood have been innocuous. These general conclusions were—

I. That the dog and cat, when exposed in a proportional or equal degree with man to the predisposing and exciting causes of cholera, are equally liable to be affected thereby.

II. That the general immunity of these animals probably arises more from the absence of a predisposition, which must be produced by the co-operation or concentration of several of the various causes above enumerated, than from non-exposure to, or non-susceptibility of the action of, the exciting cause.

III. That there are a sufficient number of authentic cases on record, to prove the liability of various of the lower animals to be attacked by cholera, epizootically or sporadically, during an epidemic constitution of the atmosphere.

IV. That the introduction of the evacuations of cholera patients into the intestinal canal of the dog and cat, by natural means, is not followed by any *specific* effect, i. e., by the development of cholera, but by the production of a simple diarrhoea, varying in different cases, according to different circumstances.

V. That the only difference produced by artificial predisposition, as above mentioned, in animals fed on the evacua-

* Edinburgh Medical and Surgical Journal, April 1854, p. 275.

tions of cholera, consists in increasing or modifying this simple diarrhoea, which was seldom or never such as to cause marked deterioration of the general health.

VI. That, as in the case of man, exposure, in certain circumstances of predisposition, etc., to the effluvia from the bodies of patients labouring under certain stages of cholera, is followed sooner or later by the generation of the disease, which may or may not be fatal, according to the amount and nature of such predisposition.

VII. That the circumstances most favourable to the efficient action of the exciting cause of cholera in animals are—

(a) Prolonged exposure to the effluvia in a circumscribed space, having a moist mild atmosphere.

(b) A weakened or vitiated state of the constitution, induced by the joint operation of one or more of—

1. Bad or insufficient food.
2. Deficient ventilation and light.
3. Deficient exercise and aëration of the blood.
4. Ochlesia.
5. Accumulation of filth and noxious effluvia.
6. Starvation.
7. Pre- or co-existence of disease.

VIII. That, in the absence of several or all of these predisposing causes, even a lengthened exposure to the same poisonous effluvia is either innocuous, or is productive of very different results.

IX. That the effluvia from the bodies of patients in the collapse stage, when respired by the lungs, or absorbed by the skin, are more fatal than those thrown off in the subsequent stages of the disease.

X. That, in experimenting on the lower animals, they must be carefully watched throughout, otherwise the disease may be so rapidly fatal that none of the ordinary symptoms of cholera may be manifested; and the observer, being thus thrown off his guard, does not deem it necessary to make a *post mortem* examination, which ought never to be neglected in all such cases.

XI. That careful *post mortem* examinations of all cases of rapid or sudden death in cattle and the domestic animals, during epidemics or epizootics, will probably lead to the discovery that cholera, as well as other diseases, though differing perhaps somewhat from the forms or types usually exhibited in man, are more common among them than we perhaps anticipate or believe.

XII. That, if there exist, during an epidemic constitution of the atmosphere, an equal or nearly equal susceptibility in some of the lower animals to be naturally or artificially affected by the cholera virus, we may expect great assistance in the prosecution of our researches on many obscure but important points in the natural history of the disease, from direct experimental investigations or observations on these animals.

XIII. That, in order to be justified in expecting, in animals exposed to the poison of cholera, the production of the disease, as it appears in man, we must imitate as closely as possible the circumstances in which he is usually placed both prior to and during his seizure.

XIV. That injections into the veins and cellular tissue, or into the stomach, or any similar artificial means of forcing the introduction of food or other substances into the system, is very objectionable, *per se* fallacious, and likely to be followed by results no less unsatisfactory than dangerous.

XV. That the dog is much more suitable for experiments of this kind than are rabbits, guinea pigs, goats, and fowls—animals which, from their dissimilarity in structure and habits to man, we should not expect to be equally liable to become affected by the same poisonous influences in the same way or degree.

The facts apparently corroborative of the theory of the contagiousness of cholera as it occurs in man, which came under my notice during the last limited epidemic in Edinburgh, Arbroath, Dunse, Coldingham, and various of the smaller towns and villages in Scotland, consisted chiefly of the following classes of cases or phenomena, where persons in

perfect health, on coming in contact with patients labouring under different stages of cholera, were immediately seized with, and died of, the disease.

1. Cholera nurses attending on the sick in hospitals or at their own dwellings, and compelled for long periods to inhale the effluvia from their bodies.

2. Washerwomen employed to wash the body or bed clothes of patients labouring under, or dying in, various stages of the disease.

3. Persons, chiefly women, employed to dress the corpses and arrange the funerals of the deceased.

4. Medical men and their assistants waiting on or visiting patients.

5. Attendants in the wards of a cholera hospital, not in very close or constant contact with the sick.

6. Relatives and acquaintances visiting patients for short periods.

7. Relatives and acquaintances attending the funerals of patients.

8. Relatives and acquaintances removing the clothes of deceased patients to a distance, wearing them or unpacking them after the lapse of long periods: in such cases, the disease was developed in persons and places previously quite exempt and healthy.

9. Other persons casually visiting rooms or houses occupied by the sick, or living in the same house, street, or neighbourhood.

10. Persons brought in contact with fomites of other kinds than those above mentioned (including furniture, etc.), either in infected localities, or in healthy places at a distance from any focus of the disease.

11. The ordinary sequence of cases in small towns or villages, where the origin of each case can be distinctly traced, and the whole progress of the disease therefore accurately followed.

Of cholera nurses falling victims to the disease, one died in the Edinburgh Cholera Hospital, one in Arbroath, and another, if I mistake not, was seized in Dunse, and died in Edinburgh: the last two were sent from Edinburgh as auxiliaries. I have known of frequent seizures with premonitory symptoms among the nurses and attendants both in hospitals and the dwellings of the sick, following the inhalation of the effluvia from the bodies of patients during long night watches. Washerwomen in particular were liable to be affected with severe nausea, vomiting, and diarrhoea, after a short exposure to the sickening and overpowering odour of the clothes of patients: in several cases, the attack was fatal. One strong healthy woman, who died very rapidly after her seizure, had washed the clothes and dressed the corpses of two ladies in whom the disease was rapidly fatal. She was not aware of the nature of their disease; so that, in this case, terror or mental emotion could have had no share in the production of her attack. Another woman had washed the clothes of patients in a cholera hospital, and attributed her seizure thereto.

In Arbroath, Dunse, Coldingham, and smaller towns and villages, where the origin of each case could be ascertained, and the actual number of attacks was small, there were numerous examples of healthy persons in contact with the sick being themselves attacked, and conveying the disease to distant places, where there was no proof of the epidemic influence having previously reached. It were useless to multiply instances; let it suffice to mention the origin of the disease in Arbroath. A brother and sister died of cholera in Dundee. Both parents went to the funeral, and, on returning to Arbroath, were both seized, and rapidly died. These were the first cases of the epidemic in Arbroath. A married daughter, living at a short distance from her parents, attended her mother's death bed, was next seized, and died. Her husband and two children were then attacked, but recovered. Her brother, a sailor, who had just returned from a voyage, was also seized, and recovered. Here one of the earliest victims of the disease was a medical student, who had attended one or two cases with his master. The sequence of cases in these small towns tended to prove that though, in a few exceptional

cases, isolated persons and places were attacked, it generally happened that between the parties affected there could be traced a direct communication. Thus there were many instances of members of a family or relatives, or the occupants of a house or street, being *successively*, and not simultaneously, attacked. This was much less the case in Edinburgh, where, in the majority of cases, the disease appeared sporadically, breaking out in several distant localities at once; but, in a large proportion of cases, careful inquiry succeeded in tracing communication, more or less direct, between different foci of disease. It is not our purpose here to inquire how far such persons were predisposed to the disease; nor could we, except in a very few cases, obtain specific or satisfactory information on this subject. Many were apparently robust, and in the full enjoyment of perfect health; but the remainder were debilitated by destitution, irregular modes of life, dissipation, deficiency of food and clothing, previous or coexistent disease, etc. A washerwoman, who died of the disease, had a constitution shattered by long continued dissipation, destitution, and old age. She had had a nearly fatal attack of cholera during a previous epidemic, and typhus no less than three times.

It is the opinion of all experienced cholera nurses and attendants with whom I have met, that the effluvia from the breath and sweat are much more dangerous, when inhaled for any length of time, than those from the evacuations: hence they avoid, as much as possible, leaning over the bodies of patients, or placing their nose and mouth in such a position as to inhale the air expired by their lungs. The powerful, peculiar, and disagreeable odour emitted by the bodies of cholera patients in the collapse stage, would naturally lead us to suspect such a result; and the experiments with the fomites already alluded to, seem to me to prove the accuracy of the opinion.

STATE OF THE WEATHER DURING THE EPIDEMIC IN EDINBURGH.

The observations on which the following meteorological tables are based were made very roughly, and with the commonest instruments, in the Edinburgh Cholera Hospital. They do not pretend to scientific accuracy, and were merely intended for the detection of any sudden or peculiar atmospheric changes during the prevalence of the epidemic in and around Edinburgh.

In Table I is given a summary of the condition of the atmosphere during the last quarter of the year 1853. It will there appear that, from October to December, there was a gradual fall in the thermometer, with a corresponding rise in the barometer. Winds, chiefly from a westerly direction, and rain, with sudden and marked vicissitudes of weather, were comparatively common. The atmosphere contained a large amount of moisture, as shown by the prevalence of misty or foggy weather, which was usually calm and mild, and succeeded cold, rainy, and stormy periods. The thermometer generally stood highest in the evening, and the barometer in the morning. With the exception of one or two days, there was a total deficiency of any evidence (exhibited by ozone test papers), of the presence of ozone in the atmosphere. But I am not on this account perfectly satisfied that this substance was absolutely deficient or absent, inasmuch as there may have been some inaccuracy in the mode of using them, or some imperfections in the test papers themselves.*

* These were procured from Mr. Cox, Pharmaceutical Chemist, Rye Lane, Peckham, London, who prepares them, I believe, from a formula supplied by Dr. Moffat, of Hawarden. The greater number of them when received were more or less tinged with a brownish-yellow discolouration. I also tried some made by myself. The test was used as follows. A slip of the prepared paper was suspended by a pin and thread from the interior of a common deal box, about 14 inches long by 8 broad and 6 deep. The lid was perforated with several holes about half an inch in diameter each, and it was made to slide for the purpose of introducing and removing the papers. It was placed in an inverted position (to prevent the introduction of rain, dust, etc.) on the top of a pailing some 6 or 7 feet from the ground, and several yards in front of the Cholera Hospital. Here it remained night and day, freely exposed to all atmospheric vicissitudes: it was generally opened once or twice daily for the purpose of observations. But, with the exceptions above mentioned, there never was any change in the colour or appearance of the papers.

METEOROLOGICAL TABLE I.

Showing the State of the Weather during the last Three Months of 1853.

	October.	November	December.
<i>Thermometer.</i>			
Mean daily temperature	40.85	44.31	38.70
Ditto, at 9 A.M.	40.66	43.56	38.33
Ditto, at 4 P.M.	51.11	45.06	39.23
Maximum daily temperature	55 ¹	54 ³	49 ⁵
Minimum daily temperature	44 ²	35 ⁴	32 ⁶
<i>Barometer.</i>			
Average for the day during the month	—	29.703	29.880
Average at 9 A.M. ..	—	29.670	30.094
Ditto at 4 P.M.	—	29.696	29.666
Daily maximum....	—	30.056 ⁷	30.180 ⁹
Daily minimum	—	29.308 ⁸	29.320 ¹⁰
<i>Winds.</i>			
Direction.....	S.W., W., & S.	S.W., W., & N.W.	S.E., W., S.W., & N.W.
Mean force (0-6) ..	2	3	4
<i>Clouds.</i>			
Class	N. cu. ci. cu. ci. s. n.	Cu. ci. cu. ci. s. n.	n. ci. cu. cu. ¹¹
Amount (0-10)	4	8	7
Degree of humidity (0-6)	4	5	5
Amount of ozone (0-6)	2 ¹²	0	0
Hail, frost, snow, fog, thunder, etc.	Fog and mist at particular times.	Fog and mist in considerable amount.	Dense fog 5 days; ¹³ mist 4 days. Hail, sleet, frost. ¹⁴
Rain (0-6)	3	4	5 ¹⁵
General remarks on weather	Changeable. An equal number of wet, windy, and clear days.	Changeable. Mists very frequent. ¹⁶	Several clear frosty days. Broken, stormy, wet, windy.

During October, the thermometer suddenly rose on the 4th from 44° to 52°; from the 11th to the 20th, it gradually fell from 50° to 44°; it rose again on the 21st, to 50°; it varied a few degrees, but remained high for some days, and then sank again on the 30th to 44°. Winds—slight in degree, but variable—were frequent during the month; they seldom blew on two successive days from the same quarter; there were few high winds. There was a great prevalence of misty weather; this probably arose from proximity to the sea. On the 28th, there was a dense sea-fog. Slight mists were comparatively common in the morning, but were dissipated in the course of the day; and the evening was frequently clear and sunny.

1. On October 23rd.
2. On October 3rd, 13th, 19th, and 30th.
3. On November 1st, 9 A.M.
4. On November 7th, 9 A.M.
5. On December 1st, 4 P.M.
6. On December 4th, 9th, and 10th.
7. On November 9th, 17th, and 21st.
8. On November 2nd, 15th, 19th, and 29th.
9. On December 9th and 10th.
10. On December 16th.
11. Strati, cirri, and cirro-strati, rare.
12. On the 23rd, when the thermometer was 54 deg. at 9 A.M. and 55 deg. at 4 P.M., and the wind high N.W. and W. The afternoon was wet and windy, but the evening was comparatively calm and starlit. On the 25th, the test-paper was browned immediately on fresh exposure to the air; but this tint speedily disappeared. The test-paper had not been in the least discoloured by exposure during the previous week; it was not affected by close proximity to, or even contact with, an electrical machine.
13. On 3rd, a mist as dense as London fog.
14. On the 10th, several lakes and ponds in the neighbourhood of the town were frozen over, so as to admit of skating.
15. Chiefly from December 13th to 21st.
16. Wet, windy or mild, calm, misty weather predominated; but there was some clear, frosty sunny weather.

METEOROLOGICAL TABLE II.

Showing the state of the weather on certain days in October, November, and December 1853, in reference to the admissions in deaths in the Edinburgh Cholera Hospital.

DATE. 1853.	THERMO- METER.		BAROME- TER.		Amount of Rain.	Amount and Class of Cloud.	Amount of Ozone.	Amount of Humidity.	Fog, Hail, Snow, Thunder, etc.	WINDS.		General Condition of Weather.	Cases in Surgeon Square Cholera Hospital, Edinburgh.
										Direction.	Force.		
Month and Day.	9 a.m. °	4 p.m. °	9 a.m. in.	4 p.m. in.	0—6	0—6	0—6	0—6			0—6		
Oct. 3	44	—	—	—	—	—	—	—	—	—	—	—	1 Coll. adm. recov.*
" 8	52	—	—	—	—	—	—	—	—	—	—	—	1 Coll. adm.
" 9	51	—	—	—	—	—	—	—	—	—	—	—	1 Coll. died.
" 11	50	—	—	—	—	—	—	—	—	—	—	—	1 Coll. adm. 1 fev. d.+
" 27	48	52	—	—	0	Cir.-cum. & st.	3	0	1	Slight mist.	sw. & s.	1	2 Coll. adm. recov.
" 28	50	52	29.25	—	0	"	1	0	4	Dense fog.	"	0	1 Coll. & 1 chol. ad.
" 30	44	47	29.70	29.60	0	"	2	0	2	Slight mist.	w.	1	1 Coll. adm. recov.
" 31	48	52	29.42	29.38	0	Nimb. & cum.	6	0	4	Mist.	se. & s.	4	1 Coll. adm.
Nov. 1	54	53	29.40	29.38	0	"	6	0	5	Slight mist.	sw. & e.	3	1 Coll. died.
" 4	51	52	29.75	29.70	0	Nimbi . . .	5	0	3	Mist.	e. & se.	1	1 Fever, died.
" 12	44	46	30.05	29.00	0	Cr.-cum. & st.	4	0	2	"	nw. & w.	0	1 Coll. adm.
" 13	42	45	29.65	29.63	0	"	5	0	3	"	w. & sw.	0	1 Coll. adm. died.
" 14	44	43	29.55	29.50	3	Nimb. & cum.	5	0	6	"	w.	3	1 Fever, died.
" 21	41	44	29.38	30.05	0	Str. & cirri.	2	0	1	Frost.	sw. & w.	0	1 Coll. adm.
" 24	37	39	29.57	29.68	2	Cir.-str. & cum.	2	0	5	Mist.	s. & sw.	4	1 Fever, died.
Dec. 6	37	38	29.70	29.85	0	Nimb. & cum.	5	0	3	Hoar frost.	w.	0	2 Coll. adm. 1 recov.
" 11	37	38	30.00	29.84	2	"	5	0	4	Slight mist.	se. & e.	2	1 Coll. adm.
" 12	38	38	29.64	29.60	3	Cr.-cum. & cum.	4	0	5	"	s. & e.	4	1 Fever, died.
" 13	34	38	29.50	29.42	4	Cr.-st. & cum.	3	0	2	Sleet, frost.	se. & e.	1	1 Fever adm. died.
" 15	38	38	29.42	29.40	4	Nimb. & cum.	6	0	6	Hail, sleet.	e. & se.	3	1 Fever, died.

* Signifies that a case was admitted in collapse stage and ultimately recovered.

+ Signifies that a case died in the typhoid or consecutive fever stage.

About the beginning of November, the temperature ranged from 48° to 54°; on the 9th, it suddenly fell to 42°; for a few days, it continued lower, ranging from 42° to 46°; on the 16th, it was further reduced to 38°; and on the 17th, to 35°. It fluctuated from 35° to 45° till the end of the month. On the 16th, 17th, 18th, and 23rd, it was 5° warmer in the morning than in the evening (9 A.M., and 4 P.M.); and on several other days there was a difference of one to three degrees in favour of the morning. Winds were comparatively frequent, very variable, and seldom high; the direction was chiefly westerly. The barometer gradually rose from 29.30 on the 2nd, to 30.05 on the 9th; it fell towards the 15th; rose again to the 22nd; and gradually fell to 29.37 on the 29th. There was comparatively little variation between the morning and evening markings of the barometer. There was a considerable amount of clear, frosty weather.

During the first week of December, the temperature ranged from 40° to 45°; on the 6th, it suddenly fell to 37°; and on the 10th, to 32°: it gradually rose to 41° on the 14th; and fell again towards the end of the month. There was not the same difference between the morning and evening temperature as was noticed in November. On the 6th, it was 6°, and on the 13th, 4° higher in the evening; and on the 2nd, it was 2°, and on the 17th, 1° higher in the morning. The barometer gradually rose to upwards of 30° on the 9th, 10th, and 11th: it fell towards the 16th; and rose again to upwards of 30° on the 21st. The markings were generally highest in the morning; but they were very irregular and variable. The frost was occasionally so severe as to admit of skating; but it was not till January 1854, that the frost or snow was at all abundant, or of long duration.

Table II is arranged for the purpose of showing the condition of the atmosphere on certain days, on which patients were received into, or died in, the Cholera Hospital. The evidence deducible from the data which this table presents is negative; since it will be apparent that the disease was equally prevalent and fatal during the cold, stormy, wet weather, or the piercing frosts of December, and the calm, mild, foggy weather of October.

From the information I had derived in works on cholera, with regard to the state of the weather during former epidemics at home and abroad, I had formed very different

anticipations. In particular, I had been led to believe that calm, mild, hazy weather, during the winter months, was that most favorable to the development and spread of the disease. Accordingly, whenever, from being, dry, clear, and frosty, the weather became moist, calm, and warm, I expected an increase in the number of cases, or a simultaneous outburst in several new localities. The probability of an outburst or increase during such weather, I believed to be heightened on holidays, Saturdays, Sundays, and any other occasions where opportunities were afforded the lower classes for dissipation and debauchery. In only one instance were my expectations in this respect fulfilled, but it was a marked one. For eighteen days no cases had been received into hospital. During the earlier part of October, the weather had been very broken and variable—a mixture of storm and sunshine, wet and dry, but not particularly cold. For a few days, the weather became clear and sunny, with a little wind; the mornings were misty, but the evenings starlight; when, on the sacramental fast day (27th), a dense sea-fog overspread the town, and the air was moist, close, and calm, though the temperature was not raised. The disease broke out simultaneously in two or three different parts of the city, in Leith, and in Dundee, where it was the beginning of a very fatal and extensive epidemic, which lasted for many months. From one focus, two collapse cases were admitted into hospital, and a third died: from the same locality, a case of cholera was brought next day, and a collapse case two days subsequently; and several cases occurred, which were not removed to hospital. From the opposite side of the street, a collapse case was brought next day; and four days afterwards, another rapidly fatal collapse case. But, in general, I found no correspondence, in date or degree, between the condition of the atmosphere, either with regard to temperature, barometric pressure, rain, moisture, ozone, winds, clouds, etc., and the progress or origin of the epidemic.

In the notes appended to Table II (see next page), I have mentioned several cases as occurring simultaneously in Edinburgh and Leith, the latter being the sea-port of the former, two miles to the north-east. The fact is interesting, as showing the epidemic constitution of the atmosphere. It rarely or never happened that a case occurred in either town, without its being accompanied, or immediately followed, by a case

or cases in the other. So invariably did this obtain, that, immediately on hearing, after an interval of varying extent, during which no cases had occurred in either place, that a person had been attacked at Leith, I made preparations for the reception of patients in Edinburgh; and I do not remember having been once disappointed in my anticipations.

Notes on the Progress of the Epidemic, etc., during the months of October, November, and December 1853.

Oct. 3rd. Two or three sporadic cases occurred about this date in Edinburgh and Leith.

Oct. 27th. A simultaneous outburst in Edinburgh and Dundee, in different quarters of their respective towns.

Oct. 30th. Several isolated and grouped cases occurred in Edinburgh. Communication was distinctly traceable between several foci.

Nov. 1st. About this date epidemic spread in London, Dublin, Dundee, and various other parts of Britain.

Nov. 12th. Several sporadic cases occurred in distant parts of the town.

From Nov. 13th to 21st there were no cases in hospital or in town.

Nov. 22nd. A fatal case occurred in Leith, and another in Edinburgh.

Nov. 26th. One of the dogs on which I had been experimenting died of cholera: and on the 27th another: the remaining animals recovered slowly but completely.

Nov. 29th. Two or three cases in Edinburgh. At Dundee the disease raged with great virulence: the mortality being about 45 per cent. Up to the 10th there had been one hundred and sixty cases, of which seventy-two were fatal.* At Arbroath, though much more limited in its diffusion, the disease was still more fatal: the deaths included a medical student and a cholera nurse.

Dec. 6th. Several new foci formed: the cases equally fatal as at the first outburst of the disease.

Dec. 14th. During the previous week, several fatal cases had occurred in distant parts of the new town, among the middle and upper classes, who were attacked in a comparatively large ratio throughout the epidemic.

Dec. 20th. Five cases were reported in town and one in Edinburgh. During the previous week there had been a few sporadic cases.

Dec. 21st. Broke out in Glasgow, and also made its appearance in various of the smaller towns and villages of England and Scotland.

[To be continued.]

Crichton Royal Institution, Dumfries, July 1854.

NOTES ON OPHTHALMIC DISEASES.

By J. VOSE SOLOMON, Esq., Surgeon to the Birmingham and Midland Counties Eye Infirmary; lately Honorary Surgeon to the Birmingham General Dispensary.

[Continued from page 483.]

PATHOLOGY AND TREATMENT OF FOREIGN BODIES INTRUDED WITHIN THE ANTERIOR CHAMBER OF THE EYE.

I do not purpose, on this occasion, to treat of dislocation of the lens into the anterior chamber, or of hydatids within the eye; but I shall confine my observations to that class of cases in which substances, entirely extraneous to the body, such as pieces of metal or stone, have been driven within the anterior aqueous chamber.

This cavity may be generally described as being limited by the iris and pupillary aperture behind, by the cornea in

front, and by the same membrane, with a narrow belt of sclerotica, and the pillars of the iris, at the sides.

The cornea, as already noticed, is a very tough structure, capable of resisting much violence. It derives additional strength from its arched form; and as it completes, in union with the sclerotica, an almost perfect sphere, the force of a blow upon the exterior of the eye becomes weakened in consequence of the diffusion of its vibrations over the surface of the globe, and the point struck is rendered less liable to rupture or penetration than it would be otherwise.

Accordingly, we find that while cases of impaction of a foreign body in the outer surface of the cornea are frequent, the intrusion of one within the anterior chamber is comparatively rare. It must be driven with considerable force, and be of hard texture, in order to obtain the latter position.

The *shape* of the foreign body is generally either acicular, cuneiform, or flat and thin with sharp edges,—as, for instance, a scale of stone, glass, or a small fragment of percussion cap. I have seen in different cases lead shot, grains of gunpowder, a bit of brass, a fragment of the cutting edge of a steel chisel, a scale of granite, long and slender pieces of hard iron, lodged in the situation under consideration.

As regards the *position* of the foreign body: in some instances that have come before me, it has projected from the concave surface of the cornea into the aqueous humour. In others, it has been fixed in the iris, or adherent to its surface. In one case, it had attachment to both cornea and iris, forming a miniature suspension bridge. In another, a piece of steel, a quarter of an inch in length, penetrated the upper circle of the corneo-sclerotic union, and hung down in front of the iris and aperture of the pupil. In several, the floor of the chamber has been the seat of the foreign body. This variety of situation is explicable by reference to the laws that govern projectiles. In some instances, if the sensations of the patients may be relied on, spasmodic action of the sphincter of the lid has been instrumental in pressing the foreign body through the cornea into the aqueous chamber.

The lodgment of a foreign body in the latter situation is a much less serious accident than its penetration more deeply into the eye, provided the retina has not, at the moment of the accident, suffered concussion.

The wound in the cornea corresponds, when recent, very exactly to the diameter of the penetrating substance, contrasting remarkably in this respect with the wound inflicted by a bullet on soft contractile parts, the orifice of which will admit only a medium sized bougie.

SYMPTOMS. The *symptoms* experienced from the intrusion are, as in injuries of other important parts, not always the same. The patient may at once suffer most agonising pain; or it may be so trifling as to be little regarded. In nearly all cases, considerable alarm is excited by the accident, and great anxiety is expressed for the removal of the foreign body.

As regards the *traumatic ophthalmia*, its degree and kind will depend much upon the nature of the injury, the susceptibility of the ocular tunics to disease, and upon the previous habits, present idiosyncrasy, and general health of the patient. In some cases, which are exceptional, inflammation of the posterior internal tunics will be the primary disorder; whereas, in others, these become only secondarily affected. The prevalent idea in the mind of practitioners who meet, for the first time in their experience, with a case of foreign body in the anterior aqueous chamber, is that vision will be destroyed by suppurative of the eyeball (ophthalmitis), unless removal of the foreign body shall be soon accomplished: such an apprehension is happily not realised, but the practice, which it instinctively suggests—extraction of the irritant through an incision of the cornea—is in accordance with the axioms of scientific surgery. The exemption from suppurative is due to the iris becoming the *focus* of the primary ophthalmia in the large majority of cases, and its behaviour under inflammation is, as is well known, that of a serous membrane: inflammatory lymph is exuded, false membranes or cysts are formed, but pus-cor-

* I cannot vouch for the accuracy of the dates, or of the number or kind of cases occurring on particular days. My data were derived from various informants and sources. They are, however, sufficiently accurate for my present purpose; which is merely to show that, between the outbursts of the disease—sporadically or epidemically—and the condition of the atmosphere (so far as the ordinary means of observation enabled me to form a judgment) there subsisted no fixed or definite relation.