ance, bilious vomiting, etc.; whilst, in a few, the attack is preceded by a distinct attack of jaundice.

In five of the cases in the table, the pneumonia was situated in the apex and upper lobe of the lung. These cases of apex-pneumonia often present features of great interest. I have seen several of them, and they have been marked, especially when occurring in women, by profound disturbance of the nervous system. Delirium of a most violent kind, sometimes assuming a maniacal character. Usually such cases do well, but they always give occasion for great anxiety, for a pneumonia of the apex is usually an indication of one of two conditions, either of the presence of some tubercular deposit, or else of a depraved and vitiated constitution.

I now proceed to speak briefly of the treatment which was adopted in these cases. In no instance was venesection practised. Only three patients were cupped, viz., Nos. 2, 7, and 9. In only three cases were leeches applied, viz., Nos. 3, 5, and 7. In Nos. 1 and 13, leeches had been applied before admission.

In twenty cases only—twenty of the early numbers of the series—antimony was given in small doses varying from one-quarter of a grain to one grain and a half, except in two cases, Nos. 2 and 6, in which it was given in doses of three-quarters of a grain and a grain.

Mercury, viz., calomel, was not given in any case. In one case, No. 10, I gave blue pill twice a day for six days, but no soreness of the gums was produced. In no other instance was mercury given except as a purgative, in combination with some other drug, at the commencement, or during the course of the treatment.

In a large majority of the cases—in over ninety—carbonate of ammonia, with spirit of chloroform and cascarilla, was given from the beginning of treatment and throughout the attack. For the cascarilla, cinchona or senega was occasionally substituted.

In a large majority of cases—more than eighty—some alcoholic stimulant—wine or brandy, more frequently the latter—was given early in the disease, usually from the beginning of treatment, and continued throughout the attack. The stimulants were given at regular intervals every hour, or every two, three, or four hours, frequently with food—beef-tea or milk. In the most severe cases, brandy was given every hour, or hour and a half. The quantity varied; it rarely exceeded six ounces daily. In a few instances, it was eight ounces, and in three, twelve ounces. In some of the milder cases, no alcoholic stimulants were given, carbonate of ammonia and spirit of chloroform with cascarilla being alone used.

In a few cases, quinine was given; and I wish to observe that I consider quinine in rather full doses a very valuable therapeutic agent in some cases of pneumonia of an adynamic type. In two cases of the series, it was given to the extent of sixteen and twenty grains daily, and a marked improvement followed its exhibition. Both these were cases in which the pulse reached 140; one was in a pregnant woman, who aborted during the attack.

Mild counter-irritation was always resorted to; large mustard and linseed-meal poultices were for the most part applied throughout the attacks; blisters were never used in the acute stage, and only occasionally during convalescence, when the matters effused into the lung were being slowly absorbed.

In every case, nutrients were allowed freely, viz., beef-tea and milk from the beginning of treatment, and solid food as soon as the patients could take it.

ST. JOHN'S AMBULANCE ASSOCIATION: DINNER TO MAJOR DUNCAN, R.A.—The members of the London Medical Staff of the St. John's Ambulance Association dined together at Limmer's Hotel, on Wednesday, October 26th, to do honour to Major Duncan, R.A., the Director of the Ambulance Department of the Order of St. John of Jerusalem in England. Dr. Sieveking occupied the chair, and was supported by Sir William Mac Cormac, Surgeon-Major Baker, and others, to the number of twenty-two. In the name of the company, the Chairman conveyed to Major Duncan the object of the dinner, namely, to thank him personally for the kind and courteous way in which he dealt with the medical men connected with the Association; to assure him that, in his work, he had the hearty co-operation of those best fitted to judge of the work, the medical staff themselves; to encourage him to continue his work, and rest contented that, whilst the work of the Association was carried on in its present well regulated form, he would enlist the sympathy of the medical profession and of all classes of the community. Major Duncan, in replying, laid the modest aims and objects of the Association before the company in his usual firm and enthusiastic way; and his speech was marked by the keen feelings of sympathy so strongly characteristic of his nature.

HYDROPHOBIA: ITS PATHOLOGY AND PREVENTION.*

By JOSEPH EWART, M.D., F.R.C.P.,
Retired Deputy Surgeon-General, Bengal Army, etc.

1. Morbid Anatomy.—The few observations I propose to make in this communication will have special reference to the pathology and prophylaxis of hydrophobia in man. In a series of papers contributed to the *Lancet* in 1855-56, Mr. Netten Radcliffe has published a very comprehensive account of the symptoms, etc., of the disease in 109 well reported and authenticated cases. He has also furnished us with a careful analysis of the *post mortem* appearances in 46 cases of communicated hydrophobia. The abnormal appearances consisted principally of intense congestion of the arachnoid and pia mater in the cranium and spinal canal, engorgement of the choroid plexuses and velum interpositum, a certain amount of red or sanguinolent serum and corresponding turgescence of the hemispheres of the brain, cerebellum, and central ganglia. "The medulla oblongata and pons Varoli were found injected in four cases. In one of these cases, the injection was slight; in another, it was more marked near the region of the auditory, facial, pneumogastric, glosso-pharyngeal, and hypoglossal nerves; and, in a third case, there was inflammation of the pia mater covering the medulla and pons". Much vascular injection was noted in particular nerves, as in the ulnar, "in the upper arm and axilla of the bitten limb"; in the membranous investment of the origins of the eighth, fourth, fifth, sixth, and seventh nerves. Some of these nerves resembled muscular fibre in colour and appearance, as did also the branches of the cutaneous nerves leading from the cicatrix." Again, "there were evident signs of inflammation at the origin of the filaments of all the cervical spinal nerves exposed, but not at the origin of the lumbar nerves. These observations were, in the main, confirmed at the *post mortem* examinations of the two Glasgow cases, under Drs. Dunlop and Patterson." The veins of the encephalon were distended with blood, which, in the longitudinal sinus at least, was fluid. The surface of the arachnoid was smeared with blood-tinged fluid over the hemispheres, and there were a few ounces of similar fluid in the ventricles. Portions of the nervous system, the cicatrix and skin around, with the corresponding nerve up as high as the elbow (patient bitten in left ungual phalanx, etc.) were preserved and hardened in alcohol and chromic acid solution. (1) In the vicinity of the cicatrix, and about an inch around it, the skin and its subjacent fat "were infiltrated with round cells, which in some parts were so abundant as to have caused absorption of the fat, the adipose tissue being replaced by round cells" (Dr. Joseph Coats, *Lancet*, February 3rd, 1877, p. 162). Dr. Coats further remarks that, in some of the blood-vessels, there was disintegrated blood-clot, and a "peculiar condition", consisting "in a production of clear, transparent, globular bodies, which look like drops of an exuded fluid, just inside the blood-vessels along their internal wall". (2) Dr. Coats also found, at very frequent intervals, "an accumulation of round cells in the perivascular spaces of the medium sized vessels" of the encephalon. The extent of this lesion was not uniform or continuous. "In some sections, there were, at one side of the vessel, a few corpuscles lying loosely outside the wall. From this there were all degrees of the lesion, till, in some specimens, these bodies formed a thick mantle around the vessel, lying in masses several rows deep. This lesion was not confined to the medulla oblongata, but existed in the spinal cord as low down as the middle of the dorsal region, and in the pons and crura cerebri. In the convolutions, it was also present in a very minor degree." Round cells of the same sort were discovered around many of the ganglionic cells and in the territories between them, in some instances in such numbers as to completely bury these centres of power. A number of amyloid bodies existed; and in only one of the numerous sections made, had there been any blood extravasated. The nerves of the arm and hand up to the cicatrix were all healthy.

Professor Maurice Benedikt, it would appear, had previously described somewhat analogous revelations from many examinations of rabid dogs, and one case of hydrophobia in man (Virchow's *Archiv*; *Lancet*, March 10th, 1877, p. 358). The round cells of Coats he terms nuclei surrounding the ganglion-cells, and forming here and there clear spots in the substance of the cerebrum. "He regards the clear spots as being formed by the fine molecular basement-tissue of the cerebral substance, from which the morphological elements properly belonging to it have been, so to speak, macerated out." He has further noticed hyaloid masses in the substance of the vascular walls bulging into the

* Read at meeting of South-Eastern Branch, East Sussex District.

lumen of the vessel, or bursting through its adventitia. "Careful examination enabled him to satisfy himself that these hyaloid masses originate from the corpuscles of the blood, and chiefly from the red corpuscles, which lose their pigment, enlarge, undergo alterations in form, and become confluent, after which they are transformed into diaphanous masses, that constitute the transparent globular bodies, looking like drops of an exuded fluid, discovered by Dr. Coats" (*Lancet*, March 10th, 1877, p. 353).

Dr. Gowers showed, at the meeting of the Pathological Society, on May 15th, 1877, "an extensive series of microscopical sections exhibiting the changes in the medulla oblongata and spinal cord in four cases of hydrophobia". Both as regards the congestion of the blood-vessels and lesions in the circumvascular sheaths and in the vicinity of ganglionic cells, there is much general agreement with the results of the microscopical investigations of Benedikt and Coats. Thus, "in all the four cases, the vessels of the grey matter were greatly distended, the distension being greatest in the medulla near the grey nuclei in the lowest part of the fourth ventricle". Then variable aggregations of the round cells of Coats, of the nuclei of Benedikt, and of the small cells of our author in the circumvascular lymphatic sheaths, and scattered through the tissue among the nerve-elements, are mentioned. Near the hypoglossal nuclei, dense collections of these cells existed, constituting, in the words of Dr. Gowers, "miliary abscesses". Smaller masses were interspersed "among the fibres of origin of the hypoglossal and glosso-pharyngeal nerves". Areas of granular degeneration existed in the closest proximity to the vessels. Sometimes, *ante mortem* white clots were found in the large veins in process of metamorphosis; "portions being different from the rest, darker, granular or spongy in aspect", and occasionally simulating embolism. In a small vessel with a swollen coat, the contained clot was proportionately reduced in circumference; and "in this vessel there were round cells in the perivascular sheath, and leucocytes accumulated in old clot and within the substance of the swollen inner coat, affording strong evidence that the cells outside were also migrated corpuscles".

The changes in the nerve-cells were by no means so distinctly developed, consisting merely of slight tumefaction, in moderate granular degeneration in their interior and around them here and there. Such as they were, "these changes were most intense in and about the hypoglossal, pneumogastric, and glosso-pharyngeal nuclei; slighter in the nuclei of the auditory, facial, and fifth nerves; slighter also in the cord, and still slighter in the upper part of the pons". The maximum amount of nerve-change and degeneration was found in the region of the "respiratory centre". In one case, in which the lesion was intensified in this centre, respiratory spasm was unusually severe; in another, in which the lesion of the hypoglossal nucleus was very marked, at the beginning of each spasm, "noise, as of the tongue being smacked against the roof of the mouth", was audible.

11. *Etiology*.—Whatever views may be held concerning the possible spontaneous generation of rabies in the canine and feline races, there can be no doubt that in man it is invariably communicated. "Very many of the best observers, recent as well as old, such as Blaine, Garratt, Magendie, Dupuytren, Breschet, Schröder, Adam, St. Cyr, Puech, Boudin, Virchow, and others, reject the theory of spontaneous development." (*Cycl. of Med.*, vol. iii, p. 441, 1875.) There is generally the history of the patient having been bitten by a dog or cat in this country; by the dog, cat, fox, or wolf, on the Continent; by the dog, cat, fox, or jackal, in India; or by any of these or their congeners in other countries. There is usually sufficient proof that the animal is either actually rabid, or, owing to its having afterwards become the subject of hydrophobia, that it was passing through the period of incubation, during which the blood and saliva may have been infected by relays of virus from the part originally poisoned. Indeed, it is quite possible that man may be infected by an infected animal, without the latter ever becoming affected with rabies at all. Sometimes the evidence is defective and conflicting. Occasionally there is no evidence of inoculation. Here the frequency with which chaps, excoriations, and epithelial or epidermic abrasions may be licked by diseased or rabid dogs or cats, or by these animals infected without necessarily becoming rabid, without attracting particular attention at the time or being recollected afterwards, should not be kept out of consideration. "The virus of hydrophobia is contained in the saliva and foam of the affected animal; also in the blood and salivary glands; and possibly also in still other solid and fluid portions of the body. It is always fixed, never volatile." (Bollinger, *loc. cit.*, p. 445.) The starting point of this terrible malady in the human subject is the insertion of this hydrophobic poison into a wound, or its effective contact with an absorbing surface, such as a chap, excoriation, or sore.

111. *Incubation*.—Once so deposited, there is considerable variation as to the exact time when the disease may become developed. According to

Radcliffe, the time which elapsed before the development of the symptoms of the disease, after inoculation, in eighty-two cases, was as follows.

10 cases	from the	2nd to the	15th day.
7 "	"	19th "	21st "
10 "	"	23rd "	28th "
6 "	"	29th "	35th "
19 "	"	37th "	42nd "
8 "	"	45th "	56th "
12 "	"	64th "	84th "
3 "	"	98th "	112th "
2 "	"	140th "	146th "
2 "	"	in 9 months.	
1 "	"	11 "	"
1 "	"	18 "	"
1 "	"	26 "	"

Dr. Hamilton, quoted by Radcliffe, ascertained the period of incubation in 104 cases as follows.

17 cases	from the	18th to the	30th day.
63 "	"	30th "	59th "
9 "	"	in 3 to 4 months.	
2 "	"	5 "	"
1 "	"	5 "	and 11 days.
1 "	"	6 "	"
1 "	"	7 "	"
2 "	"	8 "	"
1 "	"	8 to 9 "	"
2 "	"	in the 9th month.	
1 "	"	in 11 months.	
1 "	"	14 "	"
2 "	"	18 "	"
1 "	"	19 "	"

Thus, in the first series, out of 82 cases, 60 occurred between the second and fifty-sixth days; whilst, in the second series, out of 104 cases, 80 became fully developed between the eighteenth and fifty-ninth days. But, in certain cases of each series, the period of incubation is found to have extended over many months. Radcliffe, Gull, Scriven, Chuckerbutty, and Morgagni each cite a case in which the incubation covered five years and a half, thirteen years, nine years, seventeen years, and twenty to forty years respectively.

As a very general rule, it may, therefore, be acknowledged that a considerable period elapses between the inoculation of the virus and the outbreak of hydrophobia. Still, in this matter there can be no certainty, inasmuch as, in Radcliffe's series, ten cases occurred between the second and fifteenth days; or, to go into details, two took place in three days, one in four days, two in eight days, two in ten days, two in eleven days, and one in fifteen days. The all-important bearings of these facts upon prophylaxis will appear presently.

111. *Pathology*.—When a sufficient quantity of the poison has gained access to the blood—and this may be so on the third day after the individual has been locally infected—it lights up the hydrophobic tempest, provided the nerve-centres upon which it is expended are in a state of disposition favourable for its reception and operation. In the investigations of Benedikt, Coats, and Gowers, there is evidence to show that the force of the virus is thrown upon the respiratory, glosso-pharyngeal, and hypoglossal nerve-centres of the medulla oblongata, and the vaso-motor nerves related to those parts. In those cases where there is much maniacal excitement, its operation is extended to the ganglionic cells of the brain and their vascular supply; whilst, in cases where tetanic symptoms of the extremities are strongly pronounced, its action embraces much of the motor ganglia of the cord below the medulla. The most characteristic effect is respiratory and pharyngeal spasm, with more or less terror at the sight of water, or inability to swallow it. The convulsive acts of the whole of the muscles of respiration and deglutition recur with such frequency and force as eventually—in from one to four days or more—to terminate in complete exhaustion; and the heart itself, which doubtless participates in this tetanoid contraction, ceases to act, death taking place from a mixture of asthenia and asphyxia. Hence, near the end, the muscles affected become worn out, lose their irritability, or their nerve-centres become so tired, that they are incapable of exciting them to spasmodic action; or a combination of these mortal conditions supervenes, and the power of swallowing liquids and of breathing without spasm returns for a limited period in a minor degree. In the case published by Dr. Chevers in the eighteenth number of the *Indian Annals of Medical Science* (1865), in which tracheotomy was performed, as recommended by Marshall Hall, although the horror of liquids was most intense, the immediate effect was to enable the patient to drink. Still he sank by asthenia from the violence of the spasms, especially of those affecting the thoracic muscles of respiration and the diaphragm.

Doubtless, in some cases where there is great predominance of laryngeal spasm, the patient is in jeopardy of sudden death by suffocation. In reference to this point, Dr. Chevers says: "It was manifest that, previously to the operation, every attempt to drink created violent spasmodic action in three sets of muscles: (1) the pharyngeal, (2) the laryngeal, (3) the diaphragm and thoracic muscles of respiration. The operation immediately allayed and put a final stop to the injurious effect of contractile spasm in the glottideal muscles. Consequently, the patient was at first enabled to swallow liquids, subduing with difficulty the resistance of the pharyngeal and respiratory muscles. The spasmodic action in these two sets of muscles, however, gradually obtained the ascendancy, and deglutition became more and more difficult at every draught. My observation of this patient's condition convinced me that, whilst tracheotomy in hydrophobia effectually prevents suffocation from spasm of the glottis, it is still possible that suffocation may occur from spasm of the thoracic muscles of respiration and the diaphragm. This, however, was not the issue in my patient's case." In a communication I have received from Dr. Chevers, he says: "On the subject of hydrophobia, allow me to press my recommendation of tracheotomy early in the disease, immediately it is believed to be hydrophobia, as a means of preventing laryngismus, and thus of maintaining the power of the nervous system, and of giving fair play to chloroform, etc..... I do not admit that my case was, in any physiological or pathological sense, a failure; I call it a good and sound experiment, which was, as I anticipated, attended with a degree of marked success, but which failed to save life, first, because tracheotomy was employed rather late; secondly, because laryngismus, although it is the chief cause of death from hydrophobia, is not the only cause."

That the poison of hydrophobia is probably absorbed without much delay, may be inferred from our experience of the rapid absorption of hypodermic injections and snake-poison. We know that a sufficient quantity may be taken up to produce the disease in a few days, and cause death. In such cases, the dose may have been overwhelming, and the particular nerve-centres may have been predisposed to the operation of the poison to an unusual degree; whilst somewhat modified conditions may be present in the majority of cases, in which the period of incubation is much prolonged. The quantity of poison inoculated being small, the quantity immediately absorbed is small in proportion. Moreover, the susceptibility to the explosion of the hydrophobic storm may also be delayed, until the dose accumulated in the circulation is sufficient for its production. Indeed, in some cases, the amount of the virus is probably too small to produce the disease, and in others it may be successfully eliminated or neutralised; or it may just be adequate to the lighting up of a non-fatal attack of the malady. Such degrees of comparative immunity or mildness of attack in persons exposed to, and believed to have received into their systems, any of the poisons of the zymotic diseases, are acknowledged; and though, in these, there is no reason for believing that the stage of incubation is ever so long postponed or varied, as is the rule in hydrophobia, yet there is a certain measure of postponement, or some variation as to the time which elapses between the reception of the poison and the outbreak of the consequent disease. So also in the case of tubercle: this may be locally generated, and disappear by absorption, or be rendered innocuous by calcareous degeneration, and recovery take place without much general disturbance, or with a minimum of it. Or, owing to some exciting cause, such as great exposure or privation, or some inherent predisposition, the blood may become infected, and acute tuberculosis of a fatal character be set up. Again, it not unfrequently happens that many years may elapse between the introduction of the poison of syphilis into the economy, and the striking declaration of its presence in the form of specific gummata in important organs or parts.

That the quantity of the poison inoculated at the time of a person being bitten may be a material point in any given case, is corroborated by some experiments with the cobra-poison, tabulated and commented upon at pages 14, 15, and 16 of the *Report of the Snake-Poison Commission*, Calcutta, 1874. "When dogs were effectually bitten by the cobra, death resulted in fifty minutes, doubtless having been postponed on account of the long time the snake had been detained in captivity. When the poison was hypodermically injected in from two to two and a half grains, one grain, three-quarters of a grain, and half a grain, death took place on an average in one hour and forty-three minutes, one hour and fifty-six minutes, one hour and thirty-two minutes, two hours and eleven minutes. Out of three dogs poisoned by a quarter of a grain, one died in four hours and twenty minutes, one died in eight hours, and one recovered after having passed through marked symptoms of snake-poisoning. The part of the leg into which the poison had been injected became much swollen, very painful to the touch or pressure, and ultimately suppurated. This dog was large and powerful,

and there can be no doubt that it was owing to this, and its natural strength of constitution, that recovery was to be attributed. A dog weighing 14 lbs. succumbed, in four hours and twenty-eight minutes, to the eighth of a grain of the virus. The tenth of a grain killed a dog weighing 18 lbs. in eleven hours and thirty minutes; but two dogs weighing 30 and 38 lbs., although evidently affected, ultimately survived, after a similar dose of the poison. Of three dogs into which the twelfth of a grain had been injected, two were known, after being much oppressed, to have recovered, whilst the third bolted and probably recovered also. The hypodermic injection, however, of only the sixteenth of a grain proved fatal to a dog weighing 17 lbs., in thirty-one hours and twenty-five minutes; but another, weighing 40 lbs., recovered, after being evidently affected for a whole day."

Sir Joseph Fayrer, Mr. Vincent Richards, Dr. Wall, and myself, have shown that snakes may bite persons without injecting any of the virus into the tissues, or only such a minute quantity that, though symptoms may follow, the result is not necessarily mortal. So, as Sir Joseph points out in his letter to the *Lancet*, November 24th, 1874, p. 785, rabid animals may inflict wounds without depositing any, or at least a potentially effective quantity, of the poison in the wound or wounds inflicted by them. When the amount is insufficient to cause death, it is reasonable to infer that the system has succeeded in eliminating or neutralising the poison, just as animals and man have been proved to succeed in ridding the blood of small portions of snake-poison.

IV. *Prophylaxis*.—Almost universal experience shows the absolute valuelessness of any mode of treatment by drugs, after the hydrophobia has been developed. Hence, from the earliest times, the treatment of the wounds, through which channel the poison causing the malady gains access to the blood, has always received special attention in view to prophylaxis. Thus, whilst absorption has been restricted by the application of a ligature between the wound and the heart, the wound has been sucked, scarified, and cauterised by nitrate of silver or nitric acid, etc. In the practice of the late Mr. Youatt, cauterisation succeeded in four hundred persons, and four times in his own case. In reference to this point, Sir William Gull says: "If I had to choose for myself, I would inhale ether, and have the whole track of the wound destroyed by strong nitric acid or nitrate of silver." (*Op. cit.*) But as, in the hands of others, any or all of these measures frequently fail—probably owing to the whole of the infected tissue not having been brought under the operation of the caustic or escharotic—the plan usually mentioned, but not insisted upon with sufficient emphasis, in both old and recent works, is, with the modification of the additional safeguard of the application of caustic or nitric acid, powerfully reiterated by Sir Joseph Fayrer, who says: "If I were bitten by a dog or other animal, *even suspected of rabies*, I would suck the wound, put on a ligature, inhale ether (if I could not get chloroform), and have the bitten part thoroughly cut out, and then cauterised with nitric acid or nitrate of silver, so as completely to disorganise any virus that might remain." (*Lancet*, November 24th, 1877, page 786.)

Bollinger declares that "the excision of the wound or cicatrix, with subsequent cauterisation, is very efficacious. This method is continuously indicated during the entire period of incubation, and for several subsequent days or weeks, and may possibly be of advantage even during the premonitory stage of hydrophobia". (*Op. cit.*, p. 507.)

My chief aim in bringing this subject to the notice of this meeting is still further to emphasise the radical method of dealing with wounds caused by animals known to be, or strongly suspected of being, rabid. The wound should be previously sucked (it may sometimes be by the patient) by a person whose lips and mouth are free from chaps or excoriation, and a ligature applied whenever practicable close to, and between, the wound and the heart. If now excision be thoroughly executed with the single object of removing all the virus that may have been inserted into the wounds, success in prophylaxis becomes a certainty. The operation should be done under ether, every wound carefully explored, and a substantial margin of tissue removed, so as to ensure the extirpation of all the structures that may have been exposed to infection. If this be performed with patient deliberation, incised may often be substituted for punctured and lacerated wounds, healing promoted by the first intention, and the disfigurement from scarring materially diminished. If, however, there have been much tearing or laceration of parts, it may be well to cauterise the wound or wounds, after excision, with nitrate of silver, nitric acid, or strong carbolic acid, to make assurance doubly sure that any poison which may have escaped extraction by the knife may be destroyed or removed in the subsequent slough and discharge. Excision can be executed with far greater precision and completeness in bites from rabid animals than in those inflicted by poisonous snakes, because, in the former, all the poison that has not

been absorbed will be found in, or close to, the inner aspect of the wounds, whilst, in the latter, the virus, if injected into the areolar textures, may be squirted in all directions, and over a considerable area. Even in cases where a chap, or an open sore, has been licked by a rabid animal, excision is preferable to any other mode of prophylaxis.

Doubtless, excision should, whenever practicable, be performed as soon as possible. But there is reason to believe that, in exceptional cases, it may be successfully practised after cicatrization of the wounds, or even thirty-one days after the bite, as in the case published by Rust, and cited by Sir William Gull. Seeing the early period at which symptoms may appear, such postponement of the excision should never receive the sanction of the responsible medical adviser. The experience, however, is encouraging, inasmuch as it is calculated to show, as far as a single instance can, that life may be saved by excision long after the wounds have cicatrised. Perhaps the extensive changes that have taken place meanwhile in the cicatrix, skin, and subjacent fat, to the extent of an inch around the site of the original wound, in the course of a few weeks, as demonstrated by Dr. Coats, would appear to indicate the necessity for a much larger removal of structure, under such circumstances, than would be at all required were it performed immediately after the bite, or before the wound had been healed up.

In conclusion, much hydrophobia may be prevented by (1) restricting the numbers of stray, pet, and domestic dogs and cats by (a) police regulation and (b) licensing; (2) by muzzling those which are known to be excessively pugnacious, or too ready to assume the offensive, with or without provocation; (3) by careful and kindly attention to the sick and distempered; (4) by the extermination of such as become rabid.

A CASE OF HYDROPHOBIA.

By JAMES FOWLER, M.R.C.S. Eng.,
Surgeon to the Clayton Hospital and General Dispensary, Wakefield.

HYDROPHOBIA being so rare a disease that many practitioners pass a lifetime without seeing a single case, I have thought it worth while to give the following notes of a well-marked one. I was indebted for the opportunity of seeing it to the kindness of Mr. Wiseman, under whose care the patient, a fine strongly built man of sixty-one years of age, was lying at Ossett, near Wakefield.

J. L., a labourer, had always been a healthy man, never having required a doctor but once in his life, and then only for a broken finger. About two months before the first appearance of symptoms, he was putting some fresh straw into the kennel of a spaniel belonging to his master, when the dog, which had always been fond of him, and up to that time had seemed perfectly healthy, snapped at him and bit his left thumb. The same night the dog ran away, and has never been heard of since. The wound healed quickly, and the accident was soon forgotten. In the forenoon of Wednesday, May 19th, 1880, however, having been apparently perfectly well up to that time, he felt a pain in his arm, which shot up to his shoulder, gradually increasing as the day went on, and seeming, by spreading over the chest, to cause a difficulty in breathing. There was no sickness or vomiting, nor disorder of the stomach; but at the same time he could take but little food, though usually he had a good appetite; and he complained of being "starved to death", and all night was shivering and restless. Though the room was small, and there was but little air in it, he complained of incessant draughts, and called for extra curtains—saying they would "starve him to death and kill him"; just as patients with erysipelas complain of draughts, or the sensation of wind blowing over the face, etc., possibly from a hyperæsthesia of the skin, or disturbance of the circulation in it, or pyrexia. On Thursday morning, he found he had a difficulty in swallowing, in addition to the above symptoms; could eat but little breakfast, and felt depressed and out of sorts; or, as he said, "not so well"; and yet he went at half-past five to attend to a greenhouse fire, and then to his work at seven, as usual. In the middle of the day, he could not eat his dinner; but went back to his work, and worked until six o'clock in the evening. On reaching home, he could at first only swallow a mouthful or two of tea, and that with the greatest difficulty; but, determined to finish the cup if possible, he made many trials, jumping up ten or a dozen times to walk across the floor, because, as he said, he could not breathe, and eventually took the whole, having at that time no terror of liquids. It was only now that anyone thought for the first time of sending for medical advice; and, when the doctor came at last, it was without the patient's consent. Mr. Wiseman found him complaining of great stiffness of the muscles of the throat and tongue; great difficulty in swallowing; difficulty of breathing, with twitching of the mouth; and extreme sensitiveness to the least breath of air. In the early part of the night, he told his wife to open

the window, as he could not breathe; but soon told her to shut it, or "the cold air would kill" him. The night was again passed without sleep, in the greatest misery—part of the time being passed in pacing the floor of his room; he had no pain, he said, but could not "draw breath". On Friday morning, the difficulty of swallowing had increased so much that a fit of choking was induced by any attempt to drink, and after that time he was totally unable to swallow a drop. The saliva even could not be swallowed, but ran out of his mouth; his pharynx was apparently spasmodically contracted; and the breathing was very difficult, being frequently spasmodically arrested. There was almost constant twitching of the muscles of the mouth and limbs, which increased as the day went on until the movements became convulsive; and, to the previous inability to swallow liquid, was now added an extreme dread of it. Draughts of air in the room, or movements of any kind, brought on immediate spasms. Mr. Wiseman recognised the nature of the disease, and looked for and found the cicatrix on the thumb left by the bite two months ago. The patient again passed an extremely restless night, unable to stay in bed more than a minute or two at a time, continually getting up to walk about; but, on Saturday morning, slept comfortably for some time. At 3 P.M., I saw him with Mr. Wiseman. He was then sitting up in bed, in extreme agonising distress and terror, but unable to explain in what it consisted, though apparently quite conscious and rational; imploring, beseeching, by gesture and expression, for something, but unable to say what; talkative, but only in short incoherent, jerky sentences, rapidly and wildly uttered, as by an insane person: "Lord have mercy on me", etc.; and neither heeding nor answering questions, as though entirely absorbed in his own manifest distresses. If anyone approached him, he motioned with his arm for him to begone, and would say, repeatedly, "My good man, my good man, keep from front of me", being extremely intolerant of anyone passing between him and the window, even at a distance. If anyone moved in the room, or opened a door, or even spoke, there were a violent spasm of the pharynx and inspiratory muscles, and distortion of the mouth, which came on at intervals, however, without any apparent cause—possibly a reflex phenomenon, produced by some sight or imagination of something which had previously distressed him, acting on a too extremely sensitive nervous centre; or by mucus or saliva collecting in the fauces, the throat not allowing the passage of even the natural saliva, which, however, was much increased in quantity, there being by the side of the bed half a large chamber utensil full of glairy saliva, which had been hawked or spat up since morning. Though saliva rapidly accumulated in his mouth, and he constantly made efforts to expel it, there was nothing that ignorance or credulity could well exaggerate into the foaming or barking of a dog; nor did he ever make the least attempt to strike, or scratch, or bite anyone near him; nor did any of those present and about him seem in the least to expect or fear anything of the kind. At times, when convulsed, he would throw himself completely out of bed, unless restrained, but without pain apparently in the contracted muscles; and sometimes he was perfectly still and free from spasm of any of the voluntary muscles, without any tension whatever of the spinal muscles, the muscles of the jaw especially being in constant motion—spitting or speaking; while, as a rule, when not convulsed or in spasm, he was extremely restless, mentally agitated, throwing his head, or arms, or legs about, and able to raise himself in bed or walk across the floor—the case, by these peculiarities, being strikingly distinguished from one of tetanus. The face was extremely anxious, pallid, pinched, perspiring; the eyes bright, restless, glancing continually apparently with either suspicion or terror; the tongue clammy, coated with thin white fur and viscid saliva; the bowels obstinately confined—not having been opened by an aperient administered at first whilst he was still able to swallow; the pulse very small, weak, and frequent. Some hours afterwards, the body began to be covered with large, dark, livid patches. At 9.10 P.M., on waking out of a short but comfortable sleep, he called his son upstairs, and seemed for the moment still quite conscious, and in his senses; he could not speak, however, and died almost immediately—rather suddenly at last, sitting up in bed as before, only three days and a half after first complaining, and after but two days' absence from his daily labour.

As regards treatment, it only remains to be said that, practically, no treatment whatever was applied to the bite in the first instance, as the man never saw a doctor; he rubbed the wound with a "rubbing bottle" of "oils", went about for a few days with a rag tied round the finger "to keep the dirt out", and said he was "ne'er afraid of a dog-bite". Afterwards, when Mr. Wiseman saw him, hypodermic injections of morphia were administered—on Friday morning a quarter of a grain, on Saturday morning half a grain—which seemed to have a decidedly calmative and beneficial effect, inducing snatches of peaceful and refreshing slumber. But exhaustion was already rapidly setting in when I saw the case; and, though we tried to get up some enemata of strong