

CHAPTER XVII

HYDROPHOBIA

To the average man or woman of the present day the mention of the name Pasteur immediately conjures up the thought of a horrible malady, hydrophobia. For to many with the haziest notions of his connection with fermentation, silk-worm troubles and anti-anthrax inoculation his fame is emblazoned on honour's roll as the saviour of humanity from the ravages of mad dogs!

The pity is that since Pasteur's day there should have been so much scare on the subject, for hydrophobia is a complaint of the nerves and, consequently, fear is its primary factor. Various instances have been recorded of cases unquestionably brought on by suggestion. For example, two young Frenchmen were bitten at Havre by the same dog in January 1853. One died from the effects within a month, but before this the other young man had sailed for America, where he lived for fifteen years in total ignorance of the end of his former companion. In September 1868 he returned to France and heard of the tragedy, and actually then himself developed symptoms and within three weeks was dead of hydrophobia!¹ Again, a patient who threatened to bite his medical attendant, after being told that the correct symptom in a human being was the use of the fists, struck out all round him like a boxer and indulged up to the time of his death in this quite novel form of paroxysms.²

The avoidance of fear is, therefore, the main essential of safety after a dog-bite, and the very slight amount of risk may be realised by the thousands of innocuous bites received by veterinary surgeons and others in the habit of constantly handling animals. Occasionally there may be a victim to a bite in the same way that deaths have been known to occur after pin-pricks and stings of insects, while scratches and wounds sometimes bring about tetanus, of which complaint hydrophobia appears to be a variety.

According to Sir Victor Horsley's evidence before the Lords'

¹ *Études sur la Rage, par le Dr. Lutaud*, p. 262.

² *Études sur la Rage, par le Dr. Lutaud*, p. 269.

Committee on Rabies,¹ the liability to hydrophobia after dog-bite among the untreated has been variously calculated to be from five to fifteen per cent. A French authority named Bouley has stated that of 100 persons bitten by rabid animals, and entirely untreated in any way whatever, not more than five would develop symptoms of hydrophobia.

Thus, happily, the victim of a supposed mad dog stands a very good chance of escaping any trouble. To begin with, it has to be remembered that there is considerable doubt of there being any such specific disease as rabies, and a "mad dog," in the popular sense, may possibly be relegated to the same category as the "witch" of the Middle Ages! The neglected lives of the pariah dogs of the East are sufficient to account for many finally suffering from the paroxysms and other symptoms that go by the name of rabies; and when we contemplate the chained existences of numbers of dogs in Europe our only wonder is that more do not develop madness. It may safely be said that a healthy, happy life is the best safeguard against the trouble. For an animal to be in a savage state or to foam at the mouth is no real indication of rabies. For instance, in *A System of Surgery*,² we read: "Some idea may be gained of the frequency of mistakes of diagnosis in connection with canine rabies by the statement of Faber, who says that of 892 dogs brought into the Veterinary Institute of Vienna under suspicion of rabies only 31 proved to be really affected." During a scare in England, according to the *Field* of the 19th April, 1919, Mr. Robert Vicary, a well-known kennel owner, believed that "many of the experts called in to diagnose the supposed cases of rabies were quite wrong in their reports." It seems likely that many animals were merely suffering from a past scarcity due to wartime conditions; as wrong feeding has been known to produce symptoms like those of so-called rabies, as evidenced in the scare in the Klondyke in 1896, an account of which has been given in the *Journal of Zoophily*, by Arnold F. George.³

It is clear that more fear than intelligence is shown in regard to rabies, particularly as animals suspected of it are almost invariably put to death summarily instead of being kept alive *under kind and careful observation*. Moreover, once they are dead, the complaint cannot be traced by a post-mortem examination. The

¹ *Minutes* 215.

² By T. Holmes, M.A. (Cantab.), and J. W. Hulke, F.R.S., p. 329 (note).

³ See also article "Rabies and Hydrophobia" by L. Loat, in the *Bombay Humanitarian* for April, 1920.

test applied is the one introduced by Pasteur, and this brings us to his commencement of work on the subject.

It was in the year 1880 that two mad dogs were presented to him for investigation by M. Bourrel, an army veterinary surgeon. Then began the series of observations, very cruel for the most part, that resulted in the proud announcement to the Academy of Science at Paris of a process that would, so Pasteur maintained, infallibly prevent rabies from developing in persons who had undergone the misfortune to have been bitten by rabid animals.

The date of this Communication, 26th October, 1885, was made by it "memorable in the history of medicine and glorious for French Science," according to the enthusiastic praise of the chairman, M. Bouley. The day was also memorable for the inauguration of a system of intolerance, the antithesis of all that is scientific, which has, unfortunately, continued in regard to the fetich-worship of Pasteurian orthodoxy. On this past eventful date it was carried to the length of refusing to hear a word from M. Jules Guérin, Dr. Colin and others, who dared to venture criticism against the conclusions of M. Pasteur. The great man had spoken. He dared to claim infallibility—"I call my method perfect." It behoved others either to praise or else to hold their peace.

Yet how much there was to criticise! The very inoculation test for proving madness was quite uncertain. This test, introduced by Pasteur, is to take some matter—the saliva, blood, part of the brain or spinal cord, usually the cerebro-spinal fluid—from the suspected animal and inject it into a living rabbit. It is evident to common sense, apart from Béchamp's illuminating explanation,¹ that matter from one creature introduced into another is likely to be injurious, and Vulpian, a French doctor and physiologist and a supporter of Pasteur, himself found that the saliva of healthy human beings killed off rabbits as quickly as the saliva of a child who had died of hydrophobia. The condition of a rabbit after inoculation proves nothing except the strength or weakness of its powers of resistance; and yet the paralysation of the hindquarters of a rabbit is made the test of rabies in the dog from which it received the injection. True that nowadays rabid dogs are said to have *negri* bodies in the nerve-cells, or their branches, and these are claimed to be not causal, but diagnostic agents; but considering the contradictions and mistakes in regard to bacteria

¹ See *Les Microzymas*, p. 690; also p. 243 of this work.

and disease, we may well question a diagnosis that depends upon these negri bodies, especially as it does not seem to have been proved that they are always absent in other diseases.

So much for the test: now as to the prophylactic — what changes Pasteur made from the start in his nostrum! In 1884, at a Medical Congress at Copenhagen, he announced that by weakening the virus from dogs (supposedly mad) by transmission through monkeys and by fortifying it again through rabbits, he had obtained something protective to dogs and which would eradicate rabies from the world. Considering that nothing then was, or now is, known of the cause of rabies, if regarded as a specific malady, as it was in Pasteur's opinion, surely such a boast savours very much of the "cure-alls" of quackery. Pasteur himself had to admit that he had not succeeded in rendering "refractory" more than fifteen or sixteen out of twenty dogs. Afterwards he abandoned the monkey as a transmission agent, having originally chosen it, he said, because of its physical resemblance to man. In a pamphlet *Hydrophobia and Pasteur*, by Vincent Richards, F.R.C.S.,¹ the author pertinently asks: "Does the result that fifteen or sixteen out of the twenty dogs inoculated remained unaffected in any way warrant the assumption that the method adopted by Pasteur was protective?"

On the 26th October, 1885, Pasteur described his later method of treatment, which was to take the spinal cords of rabbits that had received injections of virus, keep these for varying lengths of time, then beat them up, each with twice its own weight of sterilised bouillon; finally, commencing with the weakest, inoculate the patient for ten days successively. Moreover, he triumphantly pointed to a successful case, that of Joseph Meister, a little Alsatian boy, nine years old, who had been badly bitten by a dog on the preceding 4th July, 1885, and two days later was taken to Pasteur for treatment.

This being the crucial case upon which the famous Frenchman inaugurated his claim to success, it may be as well to review it.

The worst of the many severe bites received by the child were cauterised the same day with carbolic acid. At 8 p.m. on July 6th Pasteur, by means of a Pravaz syringe, inoculated the boy with some drops of his broth of spinal cords, taken from rabbits that had died of the paralytic complaint induced by injections into the brains of these poor little animals. The actual operation was probably undertaken by Dr. Grancher, who was present on the

¹ Thacker, Spink & Co., Calcutta (1886).

occasion. For the succeeding ten days Joseph Meister was regularly inoculated, receiving in all about a dozen injections of the spinal-cord dosage.

Now, in considering this case, we must ask what proof Pasteur had of the madness of the dog and probability of hydrophobia ensuing in the victim?

The rabid state of the animal was inferred by its savagery and the fact that a post-mortem examination disclosed "hay, straw and pieces of wood"¹ in the stomach. The presence of the latter would seem far more likely to indicate that the dog had been ravenous, probably starving, a condition that in itself would have accounted for its savage behaviour. As to the boy, the number and severity of the bites he had received caused the doctors Vulpian and Grancher, who were called in, to decide that he was almost inevitably exposed to contract hydrophobia in consequence. Why? As we have seen, there was no real proof of rabies in the dog that had attacked him. But, for argument's sake, granting that the animal had been mad, it must be remembered that the wounds had been cauterised. Though opinions differ as regards cauterisation, many authorities seem strongly in favour, and reference may be made to Youatt's cauterisation of upwards of four hundred persons, including such application five times on himself, without hydrophobia developing in a single case.² Dr. Cunningham, of Chicago, reported as cauterising 120 persons annually, has averaged the mortality as about three in that number. Pasteur himself once wrote to a doctor near Paris as follows: "Sir,—The cauterisations that you have carried out ought to reassure you fully as to the consequences of the bite. Attempt no other treatment: it is useless.—L. Pasteur."³ Apart from cauterisation, the chance of hydrophobia developing in a person bitten even by a so-called genuinely mad dog has been seen to be small; and, moreover, as incubation has been known to extend to twelve months, often to two years, or more, the danger for Joseph Meister had obviously not been ended when, after little more than the lapse of three months, Pasteur dared to acclaim him as a brand snatched from the burning, so to speak, by his spinal-cord dosage. Finally, other persons, including the dog's owner, Max Vone, bitten by the same dog as Meister and on the same day, who were neither cauterised nor treated by Pasteur, continued in

¹ *The Life of Pasteur*, by René Valléry-Radot, p. 414.

² Referred to in *Rabies and Hydrophobia*, by Thomas M. Dolan, L.R.C.P.

³ *Études sur la Rage*, par le Dr. Lutaud, p. 23.

good health. Thus we see that this first much-vaunted case of Pasteurian success has no more to be said for it, when examined carefully, than that Joseph Meister, as far as his history is known, does not appear to have come off better or worse through Pasteur's treatment than several others who went without it.

But all were not so fortunate as the little Alsatian. Another child, Mathieu Vidau, inoculated by Pasteur and supposed to be cured, died seven months after treatment.¹ To excuse the death of again another child, named Louise Pelletier, failure was attributed to the bites being on the head and too much time having elapsed after the bite before the inoculation; yet Pasteur claimed that his treatment would be successful if commenced at any time before hydrophobia set in, even after a year or more. Contradictions seem to have been of no account when needed as excuses, so much so that an American, Dr. Dulles of Philadelphia, has said that on placing Pasteur's statements side by side the acceptance of almost any one demands the obliteration of the others!

The late Dr. Charles Bell Taylor, in the *National Review* for July 1890, gave a list of cases in which patients of Pasteur's had died, while the dogs that had bitten them remained well.

A notable failure was that of a French postman named Pierre Rascol who, with another man, was attacked by a dog supposed to be mad, but was not bitten, for the dog's teeth did not penetrate his clothing; but his companion received severe bites. The latter refused to go to the Pasteur Institute, and remained in perfect health; but unfortunate Rascol was forced by the postal authorities to undergo the treatment, which he did from the 9th to the 14th March. On the following 12th April severe symptoms set in, with pain at the points of inoculation—not at the place of the bite, for he reason that he had never been bitten. On the 14th April he died of paralytic hydrophobia, the new disease brought into the world by Pasteur.² What wonder that Professor Michel Peter complained: "M. Pasteur does not cure hydrophobia: he gives it!"

Certainly it may be admitted that Pasteur never professed to have a cure. What he undertook was to prevent the development of a poison that he compared to a slow train, which in the human system was overtaken, according to him, by his protective express, the inoculated virus.

¹ See *Études sur la Rage, par le Dr. Lutaud*, pp. 245, 246, and following.

² *Études sur la Rage, par le Dr. Lutaud*, p. 277-8. For a somewhat similar case regarding a Frenchman named Née, see the same work, p. 345.

Already, in his own day, there were many unbelievers in his method. To these, in the London *Lancet* for the 15th May, 1886, the following caution was addressed by Dr. G. H. Brandt, evidently a sincere believer in the words and works of the famous French chemist: "To the unbelievers M. Pasteur says: Wait! Time will reveal many facts connected with this question, and it is only by continual experience and constant observations carried on for a considerable time on hundreds of cases that we shall be able to arrive at positive and definite results."

Many years have gone by since these words were penned, and we find ourselves now in a position to study the experience and observations for which earlier critics were told to be patient.

The claim for Pasteur's success is based upon the assertion that he reduced the death-rate for hydrophobia from 16 per cent to 1 per cent. But the late Colonel Tillard has shown in a pamphlet¹ called *Pasteur and Rabies* that the 16 per cent theory of death-rate before Pasteur brought in his supposed preventive must be ridiculously wrong. As the yearly average number of deaths for France up to then had not been more than 30, the number of the bitten, according to the 16 per cent estimate, says Colonel Tillard, should have been less than 200; but Pasteur, on the contrary, had 1,778² patients during the year 1887, which meant, according to this calculation, that over 250 would have died had they not gone to him. This is nothing short of an absurdity in view of the facts, the highest total of deaths ever recorded for any year having been 66!

More than this, if we turn from France to other countries, we find that at Zürich, for instance, of 233 persons bitten by rabid animals in a period of 42 years "only four died, two of whom were bitten in parts where preventive measures could not be adopted."³ Again, "Wendt of Breslau treated 106 persons bitten by mad animals between the years 1810 and 1823. Out of this number two died."⁴ Once more, during an epidemic of rabies in Stockholm in 1824, 106 bitten persons presented themselves at the Royal Hospital, only one of whom contracted hydrophobia.⁵ Many more instances might be enumerated, such, for example,

¹ Published by the British Union for the Abolition of Vivisection, 47 Whitehall, London, S.W.1.

² This is the number given in the article on Hydrophobia in Allbutt's *System of Medicine* by Prof. G. Sims Woodhead, M.D.

³ *Rabies and Hydrophobia*, by Thomas M. Dolan, L.R.C.P., etc., p. 155.

⁴ *ibid.*, pp. 155-156.

⁵ *ibid.*, p. 156.

as the gunpowder treatment formerly carried out in the Island of Hayti, where, though dog-bites were common, hydrophobia was practically unknown.¹

Such results of pre-Pasteurian treatment surpass the best boasts of Pasteur and upset the truth of the 16 to 1 per cent reduction in mortality. Even were the latter claim correct, it would merely be brought about by the huge multiplication of cases, a method of jugglery continually found in statistics, and which, as Dr. Boucher of Paris points out,² does not prevent deaths from hydrophobia increasing while the percentage decreases!

As to this increase, facts speak only too painfully. Before Pasteur's treatment the average number of deaths per annum from hydrophobia in France was 30; after his treatment the yearly average number increased to 45. The late Professor Carlo Ruata gave the annual average mortality from hydrophobia in Italy as 65 before the Pasteur treatment, and complained of its increase to 85 after the installation of nine anti-rabic institutes. We cannot therefore wonder at the criticism that he published in the *Corriere della Sera*: "The numerous 'cures' that are boasted of in our nine anti-rabic institutions [in Italy] are *cures* of bitten persons in whom the rabies would never have developed, even if they had not been subjected to the anti-rabic inoculations; and the small number of failures represent precisely the number of those in whom the rabies has taken, and who, for that reason, die after the inoculation, as they would have died without it. This is the mildest judgment that can be passed on the work of our nine anti-rabic institutes, even if we might not unreasonably ask if some of the inoculated persons were not killed by the inoculations themselves."

As a comment on this we can add that the National Anti-Vivisection Society has collected a list of 1,220 deaths after Pasteurian treatment between 1885 and 1901, and that the British Union for the Abolition of Vivisection is making a further list, which amounts already to nearly 2,000, and that every one of these deaths after treatment has been taken from the official returns of Pasteur Institutes.

In regard to the statistical returns of these institutes, we will quote Dr. George Wilson's summary in his *Reservation Memorandum of the Royal Commission on Vivisection*: "Pasteur care-

¹ *ibid.*, pp. 188-189.

² *Anti-Rabic Inoculations: Their Deadly Effects*, by Dr. H. Boucher, published by The Animal Defence and Anti-Vivisection Society, 15 St. James's Place, London, S.W.1.

fully screened his statistics, after some untoward deaths had occurred during treatment or immediately after, by ruling that all deaths should be excluded from the statistical returns which occurred either during treatment or within fifteen days of the last injection. . . . It is in accordance with this most extraordinary rule that the percentage of deaths in all Pasteur Institutes works out at such a low figure. Thus, in the Report on the Kasauli Institute for 1910, Major Harvey commences his comments on the statistics of the year as follows: 'In this year, 2,073 persons, bitten or licked by rabid or *suspected* rabid animals, were treated'—yielding a percentage of failures of 0.19. This percentage Major Harvey explains in these words: 'There were twenty-six deaths from hydrophobia. Of these, fourteen died during the treatment, eight within fifteen days of completion of treatment, and four later than fifteen days after completion of treatment. Only the last four are accounted as failures of the treatment according to the usual definition of a failure, and it is on this number that the percentage failure-rate is calculated.'"

This screening of statistics prevents the inclusion of the death of the late King Alexander of Greece among the list of Pasteurian failures. The announcement was made, after a monkey had bitten the King, that expert advice had been summoned from Paris. Had the King lived, no doubt a pæan of victory would have proclaimed his rescue through Pasteurian methods. As the King instead, unhappily, grew worse, a discreet silence was, for the most part, observed as to his treatment, the truth as to which, however, we learn in a bulletin received by the Greek Legation in London and reported in the *Daily Mail*:¹ "Athens. Saturday. The King passed a critical night. His fever attained 105.6 deg. Fahr. and was preceded by severe shivering and accompanied by a fit of delirium, which lasted one hour and a half. This morning *he was again vaccinated*. His heart has weakened. His breathing is irregular." As the King thus died during the course of treatment, we must not only blame the monkey and not the vaccination for his death, but must not even count the latter as a failure of Pasteurian treatment.

Another more recent case cannot be thus excluded from this category. The *Daily Mail* of the 14th January, 1921, reports: "A rare case of hydrophobia was revealed in Paris yesterday when Mme. Gisseler, a Dutch woman, died as the result of having been bitten by a mad dog eight months ago. After the bite Mme.

¹ 18th October, 1920.

Gisseler was immediately treated at the Pasteur Institute and altogether received twenty-five injections of serum." The excuse then follows that "such cases of death after treatment are extremely rare"; which announcement loses its force when we consider the many deaths, like that of the late King of Greece, excluded by an arbitrary time limit from the table of failures.

Apart from the so-called "accidents" of treatment and apart also from deaths after treatment, from whatever cause, an additional argument against Pasteur's method is its introduction of a new disease, paralytic hydrophobia, entirely different from the many forms of pseudo-rabies. That this complaint is often wrongly attributed to other causes—"syphilis, alcoholism, or even influenza"—and in other cases slurred over altogether, is disclosed in a report entitled *Paralysis of Anti-Rabies Treatment*, by Dr. P. Remlinger, Director of the Pasteur Institute, Morocco, to the International Rabies Conference held at the Pasteur Institute, Paris, from the 25th to the 29th April, 1927.¹

"We were impressed," he writes (p. 70), "with the discrepancy between the number of observations published by directors of institutes and the number of cases orally acknowledged by them to have occurred. Such occurrences were commonly kept secret, as if they were a reflection on the Pasteur method or a reflection on the doctor who applied it. Such a policy appeared to us to be clumsy and the reverse of scientific." And again (p. 85) "We have come to the conclusion that certain institutes conceal their cases. On various occasions we have found in medical literature observations concerning paralysis of treatment, and we have afterwards failed to find in the report and statistics of the institutes concerned any mention of these unfortunate cases."

As far back as the 1st January, 1920, Pasteurian statistics were criticised in *The Times* by no less an authority than the eminent statistician Professor Karl Pearson, well known as the Galton Professor of Eugenics and Director of the Laboratory for National Eugenics at the London University. Questioning the boast of Pasteur's "conquest of hydrophobia," he wrote:

"Full statistical data for the Pasteur treatment both in Europe and Asia are not available. What data are published permit of no prudent statistical judgment. If the Indian Government is in possession of information on this point, why is it withheld? If it does not possess it, why does it not obtain it and issue it? Is there any cause for dissatisfaction with the results obtained, and have any

¹ Publications of the League of Nations. III. Health. 1927. III. 14.

changes been made in the treatment on the basis of such dissatisfaction with the results obtained, and have any changes been made in the treatment on the basis of such dissatisfaction or for any other reason? These are questions for which answers should be demanded in the House of Commons. No Government is to be blamed for adopting a course recommended by its scientific advisers. But it sins not only against science and humanity, but against the brute world as well, if it does not provide the material it must possess for a judgment of the success or failure of its efforts. In our present state of knowledge I venture to assert that it is not wise to speak of the 'conquest of rabies.'

I am, Sir,
Yours,

KARL PEARSON.

University College, W.C.1."

Such is the expert statistical commentary that after all these long years replies to Pasteur's request to await the verdict of time and of experience.

Even the information obtainable from the Pasteur Institutes can hardly be encouraging to believers in Pasteur's treatment. For instance, if we turn to the reports of the Pasteur Institute at Kasauli in India, we find the big increase from ten deaths from hydrophobia in 1900 to seventy-two deaths in 1915. Against this we can scarcely set the corresponding increase in cases, because so many of the latter cannot be described as genuine; it is frankly acknowledged in the Sixteenth Annual Report¹ that many of the Europeans have undergone no risk whatever. We can well believe this when we recall the example of Lord and Lady Minto, who went through the course of inoculations merely because their pet dog had been bitten by another dog supposed to have been mad! A large proportion of the Indians can run no risk either, except from the treatment, seeing that the patients, according to the report's own showing, have not all been bitten, but many merely "scratched," or "licked," and not all by rabid, but many by merely "suspected" animals. Moreover, these animals include human beings, cows, calves, pigs, deer, donkeys, elephants and almost every known species! Between the years 1912 and 1916 there were 114 patients who had been bitten by horses and eighty who had been the victims of human bites! Thus we see that in a considerable number of so-called "cures" there is no pretension to the patients ever having run any risk from actual mad-dog bites.

¹ p. 21.

In an interesting note this Sixteenth Annual Report¹ recommends "the use of atropine² in cases which have developed symptoms of rabies." It goes on to say: "The use of this drug was suggested to us by Major F. Norman White, I.M.S., to whom we acknowledged our thanks. Its effect is to relieve throat spasm, and if it be given at suitable intervals, this distressing symptom can be entirely obliterated, with the result that the patient is able to eat and drink. Apart from this beneficent effect, there is always in the background the hope that in certain cases throat spasm (which is the proximate cause of death) might be held in check until the phase of recovery had set in. . . . *Clearly the most hopeful cases would be those of the untreated*, in which the incubation period was naturally a long one. . . ."

So here we find Pasteurian workers themselves acknowledging a possible *cure* which has no connection with Pasteur and, on their own admission, it is as likely as not to be more profitable without the addition of his treatment.

For the matter of that, hydrophobia has never been a complaint without a remedy, even after the paroxysms have set in. Pilocarpine, a drug which induces profuse sweating, has been known to cure cases; while, on a similar principle, Dr. Buisson of Paris, author of a treatise, *Hydrophobia, Preventive and Curative Measures*, cured himself of an attack by the use of a vapour bath and inaugurated a remedial system, named after himself, which has been most successful.³

It is, to say the least of it, remarkable that definite curative measures should be overlooked and set aside for a mere preventive which cannot set forward a single tangible proof of ever having saved anyone, while, on the other hand, as we have seen, there is undeniable evidence that it has occasioned a new complaint, paralytic hydrophobia. For such procedure there must be some explanation, and perhaps the Indian paper *The Pioneer*, for the 12th March, 1919, unconsciously provides it:

"The Central Research Institute⁴ at Kasauli has developed its vaccine production to an almost incredible extent. The yearly average before the war was 18,500 cubic centimetres; during the

war it rose to over 2½ million cubic centimetres, and included anti-typhoid, cholera, pneumonia and influenza vaccines. From a monetary point of view alone the value of the Kasauli vaccines for the period of the war was about half a million sterling."

Pasteur's inoculations for hydrophobia form part of a vast money-making system, in which the beneficiaries have no wish that any item should be discredited. The Kasauli returns are only a fraction of the monetary gains accruing in Europe, Asia and America. A few years back we were told by Professor Ray Lankester that the Lister Institute in London made £15,800 a year by the sale of vaccines and sera—a sum that seems likely to have increased largely. Thus we find science dominated by commercialism. Were it not for pecuniary advantages, there seems little doubt that the broth emulsions of spinal cords would have gone the same way as an older less nauseous panacea—"the hair of the dog that bit you"! From the earliest records of history, the prevalent mania seems to have been for "frightfulness" in medicinal remedies; but the witches' cauldron itself never surpassed the noxious nostrums inaugurated by Pasteur in what has proved indeed "a new era in medicine." It is the era for the injection into the blood of matter of varying degrees of offensiveness, the era in which animal experimentation, vastly increased, has found its sequence in experiments on human beings, and the credulous and ignorant are everywhere at the mercy of the subcutaneous syringe and thereby swell the monetary returns of the manufacturers of vaccines and sera!

¹ p. 35.

² "We have found the 1/100th grain of the sulphate, injected subcutaneously every four hours, is usually sufficient to obliterate spasm." *Kasauli 16th Annual Report*, p. 36.

³ For cases of cures, see *On Rabies and Hydrophobia*, by Surgeon-General Thornton, C.B., M.B., B.A.

⁴ A separate institution from the Pasteur Institute.