XXXVIII.

PROTECTION AGAINST HYDROPHOBIA.

BY J. M. PARTRIDGE, A.M., M.D.,
MEMBER STATE BOARD OF HEALTH OF INDIANA.

The disease known as hydrophobia in man, and rabies in the animal, is as ancient as history itself. It is mentioned by Aristotle, Pliny, and Horace, but its virulent nature and alarming consequences seem not to have been well understood by the ancients, and Aristotle believed that man was not subject to its attacks; but it is now known to be peculiarly universal, and is perhaps the only disease which attacks alike man and the whole animal creation. Three hundred years ago the disease was very prevalent on the continent of Europe, but was comparatively rare in this country until the last century. Fifty years ago it was much more prevalent in this country than it is now. It has always been more prevalent in Europe than in America, probably on account of the greater density of population, and the consequent closer proximity of dogs to each other and to men. For the same reason, it has always been more prevalent in cities than in the country. There has been a greater mortality in France, in the vicinity of Paris, than in any other part of the world. Some countries seem entirely exempt from the malady. Hydrophobia is not known in South Africa, Egypt, Syria, Lisbon, and the South Sea islands, where dogs abound in swarming multitudes; and in Constantinople, where dogs roam at large, and subsist on offal of all kinds and descriptions, the disease is of very rare occurrence. In Jamaica it had not been known for at least forty years previous to 1783, when it was introduced by an infected dog from America. The island of Madeira is fairly overrun with curs of the most wretched condition and description, and they are affected with almost every disease, tormented by flies, by heat, by thirst, and by famine, and yet no rabid dog was ever seen there. In France the mortality from this disease is about one case annually in each 2,000,000 of inhabitants. In the department of the Seine, including the city of Paris, with an average population of about 1,000,000, for the forty years preceding 1870 there were ninety-four cases, being a little more than two and one third deaths per annum to 1,000,000 inhabitants. The death rate for the city of Paris is much greater. In the city of New York, with a population of about 1,000,000, for the six years preceding 1872 there were twenty-two deaths reported, or an average of three and one third per annum for 1,000,000 inhabitants.

Hydrophobia is communicated or induced by the bite of a rabid animal, usually the dog. The cat, fox, badger, wolf, and jackal are known
to have communicated the disease. The bite of a rabid animal does not by any means invariably induce the disease. The bite of some animals is more dangerous than that of others. Dr. Watson reported 114 cases bitten by rabid wolves, of whom sixty-seven, or more than one half, became inoculated and died, while of fifteen persons bitten by a mad dog only three, or one fifth, died. Dr. Hunter reported twenty-one cases bitten, and only one died. The experiments of Prof. Renault, of the veterinary school of Alfort, have demonstrated that not more than 33 per cent. of dogs bitten by rabid animals has become inoculated.

It is generally believed that only carnivorous animals communicate this disease; and of man, who stands midway between the carnivora and the herbivora, there is a difference of opinion as to his liability to communicate the same. I know of no case on record where hydrophobia has been communicated from man to man. Dr. Earl, of London, having been bitten by a rabid patient, immediately amputated the bitten finger. On being accused of rashness and needless fright, he inoculated several rabbits with the saliva of this patient, and some of them became rabid. Of two dogs inoculated with rabid virus from a man, one became rabid. Many experiments have been made to determine whether herbivorous animals can communicate the disease. In nearly all cases the effort signal failed. On this point, Prof. Youatt says,—"I can imagine that the disease shall not be readily communicated by the saliva of a graminivorous animal, but I have once produced it in a dog by the saliva of an ox, and twice with that of a horse, but in very many cases I have failed to do it." It appears, therefore, that the saliva of carnivorous animals is most infectious; that the saliva of man is less infectious; that the saliva of herbivorous animals is least infectious; but that it is possible for any rabid animal to communicate the disease.

The period of incubation, or the time intervening between the date of inoculation and that of the development of the disease, varies more than in any other contagion. The shortest period reported is seven days. In some well authenticated cases the period was several months, while in some more doubtful cases a period of several years is said to have elapsed. The most authoritative statisticians say the period is from eighteen to fifty-nine days.

The terrible symptoms or manifestations of this disease, too frightful almost for contemplation, are too well known to need recounting here. Post mortem examinations have revealed but slight pathological changes or morbid processes,—chiefly some congestion of the brain and nerves, with slight destruction or degeneration of the nerve tissues.

The mortality in this disease is almost total, and it was generally believed to have resulted in certain death. The most favorable statistics report not more than two or three recoveries in one hundred cases; but the recent observations of Pasteur have thrown a flood of light on this subject, and given us a ray of hope for the future. In 1880 Pasteur began the investigation and study of hydrophobia. Having first transmitted the disease to a rabbit by inoculating it with the saliva of a child who
had died of this terrible disease at the Trossou hospital, he observed that the tissues and blood of this animal contained a special and peculiar microbe or bacteria, which was easily cultivated in a state of purity, and the successive cultures of which developed the disease, with fatal results, in other rabbits. The next important conclusion reached is, that the brain is essentially the seat of the disease; and not only is the brain rabid, but also the entire spinal marrow; and the nerves themselves throughout their entire length, from centre to periphery, abound in the rabid virus; and, while the salivary glands are likewise rabid, it is due to the fact that the nerves which terminate there gradually empty the virus therein.

But the great practical result of these investigations consists in having determined the method of procuring a modified virus, which is harmless in the system, but which prevents the possibility of inoculation by the rabid virus. Pasteur believes he has attained this result, and he has submitted his theory to the French Academy of Science, and asked that a commission be appointed to test the same.

If we apply rationally the results I have just communicated, we can easily render dogs proof against rabies. The investigator may have, at his disposal, the virus of rabies in different degrees of attenuation, the non-fatal kinds preserving the economy from the effects of the more fatal kinds. Let us take an example: We take the virus of rabies from a rabbit which has died, after inoculation by trephining, at the end of a period of incubation exceeding by several days the shortest period of incubation commonly met with in the rabbit. This period invariably occurs between the seventh and eighth days after inoculation by trephining with poison of maximum virulence. The virus from a rabbit with the longest incubation period is inoculated again by trephining in a second rabbit; the poison from this rabbit in a third. Each time the poison, which is becoming more and more virulent, is communicated to a dog. The dog is at length found capable of resisting a poison of fatal virulence. He becomes, in fact, entirely proof against rabies, when the poison of the mad dog of the streets is introduced into his system, either by intra-veinous inoculation, or by trephining.

The French minister of public instruction has accepted Pasteur's proposition, and has appointed a commission to test his theories and determine the accuracy of his conclusions. Scientific and medical men will await with great interest the report of this commission. If it is favorable, and if it should be shown that by inoculation with a non-malignant virus, hydrophobia can be intercepted and prevented in man, and rabies can be suppressed and stamped out in animals, then medical science will have achieved a brilliant victory.