The Eradication of Glanders and Anthrax in Man and Animals.

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When we seriously consider disease in all its aspects, and in particular the ills of animal origin to which human flesh is heir, the desirability and indeed the necessity for the close touch of medical and veterinary science and the co-operation of members of both professions in control of disease, must be accepted. Common interests which are so apparent, make the association a perfectly natural one. If success in public welfare is to be achieved, the same broad road must be traversed, and though the by-ways and collateral avenues have to be explored by the two professions respectively, the same goal is before us.

For my lecture I have selected glanders and anthrax, almost the two oldest diseases known to the veterinary profession. Though old, they are by no means threadbare, and I hope to clothe them in colours reflecting the progress and the sterling good work which at all events have been shown in veterinary science and policy.

(I) Glanders.

In olden days before the light of hygiene, sanitary science, and research troubled the microbial world, this disease provided our stock terror. It was our Napoleon which scourged armies and other studs of horses in close communion. It has now been bereft of any terror or danger to man or animals, for—to continue in popular phraseology—our Napoleonic enemy has been killed by that staff college graduate mallein. In no instance can the progress of veterinary science be so clearly demonstrated than by the downfall and almost total eclipse in this country of this, at one time, serious disease. Last year only three outbreaks were recorded, this year up to date only two, and we may take it that practically it stands at the door of eradication from the British Isles. Two other factors responsible for its eradication are, first, the diminution and in some instances the total abolition of large industrial studs of horses in cities, and particularly in London and the surrounding counties where about 90 per cent. of the disease occurred; and secondly, the more complete Glanders or Farcy Order of 1907, with its extended provisions issued in 1920 for compensation, and the application of the mallein test.

Relatively glanders is easy of suppression. The real combative agent in the eradication of the disease, however, is the substance mallein. No veterinary expert would ever dream of handling an outbreak without its aid. It seems a cruel fate that the Russian veterinary surgeon, Kalning, who discovered it should have lost his life from glanders. By its agency in a diagnostic test, elimination of diseased animals at a period before danger of communication is probable, becomes a matter of supreme simplicity: we are in a strong position accordingly. To illustrate the comparative ease in handling outbreaks, the sense of security, the reduction in loss of animal life and the consequent saving to the public, and the minimum amount of inconvenience imposed on owners and others which this practical diagnostic agent carries, I

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will quote two instances in my personal experience, the one in pre-mallein days and the other of recent date under the trying and difficult circumstances of war. In August, 1892, in a battery of Royal Field Artillery (110 horses and nineteen grass mules) at Cawnpore, in India, a serious outbreak of glanders occurred. Two virulent cases were discovered in the veterinary hospital and inspection of the battery revealed four more clinical cases—not a very promising beginning. According to rule the battery was sent into isolation, which was carried out in a grove of mango trees one and a half miles distant. Over thirty animals were destroyed altogether, including those showing suspicious symptoms or unthrifty look. The outbreak covered a period of several months, and during that time the battery could take no part in combined training. Successful issue resolved itself into isolation up to and over the accepted period of incubation and strict periodical inspection of every animal for clinical signs of the disease, the unit not being declared free until four months after the last case. The whole procedure was laborious, inconvenient and vexatious. Mallein had only been discovered the previous year, but its use had not been extended to India. No more fitting example of the difference in present-day handling of the disease can be furnished than by our experience during the late Great War. I speak for the British Expeditionary Force in France and Flanders only. In that theatre approximately 750,000 horses and mules took part, and in spite of the vast movements of animals, the commingling with Allied Forces, and the occupation of enemy positions of doubtful nature, our force was kept relatively free, thanks to the use of mallein and a highly efficient veterinary service.

The procedure of control briefly was as follows: Every animal on arrival in France from overseas was subjected to the mallein test at the base remount depots. Similarly on evacuation from the front to a reception veterinary hospital on lines of communication animals were tested, and again on discharge to a remount depot after cure. Remount depots and veterinary hospitals were thus kept free. Animals were also subjected to the test on being cast and sold to the French public. In the event of a reaction to the test occurring, whether in an animal evacuated from the front or otherwise, the fact was referred by telegram to the formation concerned and all animals of the unit to which the animal belonged were tested. Reactors were destroyed. Doubtful reactors were re-tested in three weeks' time. Frequently two or more tests of a unit were required at intervals of three weeks before entire freedom was assured. In the autumn of 1915 the frequent reactions encountered in animals evacuated from the front indicated a certain menace and it was decided to test the whole force. This was done during the winter, about 300,000 animals being subjected to the test. The disease was cleared out, and even though we were again threatened on the arrival of the Portuguese Expeditionary Force in the spring of 1917, and again on the return of a division from Italy, we had no more trouble. The total numbers of animals affected (reactors) were eighty-five in 1917 and thirty-six in 1918.

At first the method of testing employed was the ordinary subcutaneous cervical, which consists of a local and a thermal reaction in affected animals. The stereotyped system of temperature registration, before and afterwards, at the ninth, twelfth and fifteenth hour under the cervical method proved an impossible burden in war where large numbers of animals are necessarily dealt with, and the usual practice of laying animals out of work for forty-eight hours, was an inconvenient feature. Therefore the system known as the intradermo-palpebral method was adopted, the advantage claimed over the
older cervical method being that it is a more suitable field test, that no temperature registration is necessary, that a reaction consisting of cedema of the lower eyelid and the profuse muco-purulent tears is more readily determined and with less doubt than by the cervical method. And it was subsequently found that animals could carry out their ordinary duty, if necessary, while under the test—a fact which removed any possible objection on the part of commanding officers of units. Personally, I have no doubt in my mind as to the superiority of the test as an eliminator of glanders. In a doubtful case at the twelfth, or even twenty-fourth hour, the subcutaneous cervical method can always be applied as a control. The cost per dose is very considerably less, representing a large saving when armies have to be considered. Over two million doses were used in France alone.

Thus has an old enemy in war been defeated. The presence of glanders in a military unit, even in war, is now looked upon as somewhat of a reproach, and if encountered it only serves to illustrate prowess in suppression by means of mallein. Its extinction in civil communities in Great Britain is within measurable distance and the Board of Agriculture with Sir Stewart Stockman and his staff have reason to be proud of their labours. Once clear, the application of the mallein test on importation of horses, mules and asses, will maintain freedom.

Now for the human side of glanders. Unfortunately a considerable number of lives have been lost from this loathsome disease, the cure of which is extremely rare. Victims have been mostly persons immediately associated with horses, and regrettable accidental infection has frequently occurred in laboratory workers. No less than seven European scientists working on the disease lost their lives during the years 1891-92. One of the discoverers of mallein died from it, and a well-known member of our College contracted it, but, after a long and terrible experience, was, I am pleased to relate, cured of the disease.

Comparative figures of incidence between men and animals are not available, but the late Mr. William Hunting in his work on glanders mentioned that:—

"During the years immediately following 1899 when the spread of glanders among horses continued and increased, deaths among men began to attract some notice. It was shown that whereas the Registrar-General returned about six or seven fatal cases per annum, a larger number were probably never recognized, but registered for burial as typhoid, influenza, rheumatic fever or blood-poisoning."

He adds that:—

"There is very little doubt that ten times as many human deaths from glanders have occurred as have been accredited to that cause by the Registrar-General."

At the same time it is certain that man shows a strong relative immunity. In the light of veterinary experience the application of the mallein test to human beings should make diagnosis positive. I know of one instance where this was tried, a positive reaction resulting.

However, the eradication of the disease from horses, asses and mules will carry with it a corresponding extinction in human practice, for infection in man is by direct inoculation, though Hunting from analogy with what occurs in animals upheld the theory of infection by ingestion also.
(II) ANTHRAX.

If the advancement of veterinary science has been accompanied by a practical disappearance of glanders from animals and man in this country, the same unfortunately cannot be said of anthrax. This disease presents a much tougher proposition, and it still provides a full field of inquiry for medical and veterinary scientists and for biological and chemical research workers, and calls for the serious attention of legislators and employers of labour. Despite our present knowledge and measures of control it continues to prevail, and the situation in respect to eradication seems somewhat hopeless and well-nigh impossible. However, it will be useful to analyse and discuss certain factors in relation to the disease, and to see if any admit of diminution or change which could be worked upon to reduce incidence both in men and animals.

Anthrax, as a disease, is much more formidable in animals than in man. The veterinarian, and particularly if he has served in eastern climes, experiences it in its intensest virulence, and it is manifested to him in a fulminant or apoplectic form, more usual in sheep, as splenic fever, invariably occurring in cattle and commonly in horses, and as an external type, less severe but common amongst horses in the East. In man the forms presented are malignant pustule and the so-called woolsorter’s disease.

The bacillus of the disease (Bacillus anthracis) through the growth of which in the fluid tissues of the body the terrible train of symptoms is produced with such startling rapidity and the virulence of which appears to be increased by certain repellent characteristics of its capsule, is easily destroyed by physical and chemical agencies, and in unopened carcases under putrefactive changes it has a relatively short existence. But unfortunately for control, the bacillus, under aërobic conditions, forms a spore, and it is to this circumstance that all our difficulties are attributed. It is the most resistant of all known spores, and it is capable of retaining its vitality for a large number of years. Unless means are available of encompassing its death or of preventing the accomplishment of its life history, eradication of the disease is beyond the reach of possibility. All combative knowledge and energy must be directed towards it specially as our arch enemy, and necessity more particularly arises from the fact that so many animal products, e.g., wool, hair, hides, bone manure, and feeding materials for animals, are imported, each offering possible media of infection.

In studying the causal agent of anthrax not only in regard to pathogenicity, but also in regard to its life history altogether, and to its amenability to destruction, we must constantly bear in mind its analogy with other and higher forms of plant life. Conditions favourable for growth are more or less similar, and what prevents or destroys germination in the one may do so in the other. I am not satisfied in my mind as to whether the organism of anthrax in nature is a pure saprophyte, that is to say, living on dead or decaying matter in the soil, or whether it is parasitic to living plants in addition. In India outbreaks usually follow rain, chiefly in the monsoon season, and the medium of infection lies in the fresh grass supply. The clean grass supply of Government grass farms has tolled the knell of the disease so far as army and cantonment animals of India are concerned, but in the old days of unit grass-cutters, who were sent into country districts to collect grass from roadsides or any other apparently favourable spot, the disease was much more prevalent. Soil infection in India is the cardinal point of incidence, and it
may be interesting and instructive to relate examples of the longevity of the organism in soil or places. Whilst I was Senior Veterinary Officer in the Meerut Division in 1906 I took the precaution of recording small localities or pieces of ground which were proved to be anthrax-infected. The Viceroy’s bodyguard at Dehra Dun could never make use of grass in the immediate neighbourhood of their sick lines, because at one time or other a post-mortem examination had been made there and blood spilt. On two occasions within my personal knowledge anthrax supervened when attempt was made to use the grass. Similarly the bodyguard horses would contract occasional anthrax from grass obtained from the halting places of the old Saharanpur-Dehra Dun Mail Tonga route in use before the railway was built, so much so that they were placed out of bounds. One can readily picture mortality from unrecognized anthrax among Tonga and Ekka ponies along that route and the consequent infection of soil. The Artillery cricket ground at Meerut was infected through the death of two bullocks, a post-mortem having been held and the buckets washed at the well in the corner of the ground. I should explain that it happened before knowledge of sporulation and of the extreme danger of spilling blood became so precise that it was subsequently drilled into everyone. A considerable number of years after a hay crop from the ground was tried, and, anthrax resulting, the stack was destroyed and a ban put on the ground. Again at Meerut during the rainy season of 1906 I was asked by a young civil servant to see his valuable pony which had died in great distress and agony during the night. The evidence of the veterinary assistant and the external appearances indicated anthrax, and a careful post-mortem examination at one of the incinerators built for the disposal of carcasses in cantonments confirmed the diagnosis. I asked the owner where his grass supply came from for the past four days, and he showed me the exact spots in his own compound. It seemed impossible to connect them with infection, but just at the moment of discussion the collector of the district joined us, and I explained the situation to him, whereupon he exclaimed: “Oh, but I remember when I joined the Civil Service, twenty-five years ago, a road passed through this compound, and there were sweepers’ houses just over there” (indicating the position). The source of infection was thus immediately solved—mihtars’ habitations—anthrax or doubtful flesh or skins brought to them being responsible.

There is no doubt as to the considerable soil infection existing in India and countries contiguous to it—Afghanistan, Baluchistan, Persia, Tibet. Past history and present reports point to this. I am bound to give prominence in my remarks to soil infection in countries from which animal products and foodstuffs for animals are imported into Great Britain, because it unquestionably reflects the incidence of the disease at home both in man and animals.

Sir Stewart Stockman, in his annual reports issued from the Board of Agriculture, is distinctly of opinion that soil infection at home is not so prominent a factor, but that incidence in animals is from extraneous sources. In an analysis of 1,597 confirmed cases for the years 1905-10 he shows that (a) 13·6 per cent. were traceable to a previous case; (b) in 69·5 per cent. evidence pointed to infection from artificial feeding stuffs or manure; (c) in 19·1 per cent. there was no history of former outbreaks, nor of artificial foodstuffs, nor manure. Of 197 outbreaks on previously clean farms in 1919, inquiries pointed to the probable source of origin being the use of imported feeding stuffs in 107 instances, while, in 1920, out of 399 outbreaks on previously clean
farms, 294 were attributed to imported feeding stuffs and thirty-one to both imported feeding stuffs and artificial manures. Moreover, he shows that incidence in animals is not so apparent in the season of summer when grazing is usual, but it is greater during the winter months, when stall feeding on cake, meal, &c., is in process—a very significant fact, proving Sir Stewart Stockman's view.

Industrial anthrax in human beings is chiefly from extraneous sources. In the case of wool, Persian (including Baghdad and Bussorah wools) and East Indian materials are the most dangerous, and it may be noted that the so-called East Indian wool includes, Indian, Afghanistan, Baluchistan, Waziristan, the North-West Frontiers, Tibet, and a certain amount of Persian wool sent by sea to Karachi. Of mohair, Turkey and Van skin mohair, and Cape mohair are all offenders. Skin alpaca from Peru, East Indian goat hair (other than mohair), East Indian skin Cashmere, and Egyptian raw wool also show a high degree of infection. The greatest amount of industrial anthrax in Great Britain exists in the woollen industry, and skin wool is more dangerous than shorn fleeces. Hides and goats' skins received from various countries, chiefly from China and India, and horse hair from Russia, China and Siberia, all add their quota.

From what I have said it is quite obvious that the whole anthrax question resolves itself into a world problem, and it is equally apparent that incidence and its reduction in human beings is contingent on the completeness, more or less, of the control of the disease in animals. In other words, it is primarily an agricultural, or more particularly a veterinary question, and in the framing of measures for the eradication of the disease this most essential and basic fact must not be lost sight of. I have read very carefully the Proceedings of the Departmental Committee on Anthrax, 1918, a most valuable and instructive publication; and I cannot but admire the care with which investigations were conducted, and agree in the main with the conclusions arrived at and recommendations put forward. But if I had to criticize the Committee's findings, in the full knowledge which I possess professionally, I should say that they should have made a stronger onslaught on the cause and gone more to the root of the evil, while allowing their excellent recommendations to stand. It is to be hoped that the Advisory Committee appointed by the International Labour Organization to report in 1923, will make the veterinary aspect the first and chief plank in their deliberations. As nearly all the incidence in human beings and 70 per cent. in our home flocks and herds is traceable to extraneous sources, it is for exporting countries of animal products and feeding stuffs, in the first instance, to initiate and maintain a plan of campaign by means of which disease in their flocks and herds can be reduced. I quite realize the difficulty and to all intents and purposes the non-feasibility of this in foreign countries in which civilization is crude and where the state of society is such that men are laws unto themselves; but even in these there are ways and means that might be tried, e.g., propaganda, classification of wool and hair which might ensure better exclusion of doubtful material, the appointment of commercial attachés to embassies or consulates who could watch over and act in home interests.

There is, however, no excuse for our Dependency of India from which so much of our raw materials of wool, hair, hides, linseed and other feeding-stuffs are derived. The amount of contagious animal disease in civil districts in India is appalling, and the means for control are absolutely inadequate. This reflects seriously on a portion of our Empire.
Section of Medicine

But what can be expected of a department—the Civil Veterinary Department—to which no head officer is permitted to co-ordinate the efforts of the veterinary staff of the department in the provinces, which numbers only thirty-five British veterinary officers, including professors at colleges, laboratories, and officers on furlough, for the whole of India and Burma, and includes an altogether inadequate subordinate staff of Indian veterinary inspectors and veterinary assistants, the reporting of disease to whom is left to the village "patwali" or revenue tax collector. There is no Contagious Diseases of Animals Act such as exists in other well-ordered parts of our Empire. A Glanders and Farcy Act has existed for many years and surra has been scheduled under it. Recently also a Dourine Act was brought into force. During my tenure of office as D.V.S. of the Army in India I pressed for a proper Diseases of Animals Act (India) in consequence of serious inconvenience and loss amongst army transport bullocks and slaughter animals of the Afghan and Frontier Expeditions of 1919, and at the request of the honourable member in the Revenue and Agricultural Department of the Government of India, brought out such an Act which was very ably edited by one of my administrative veterinary officers. It was not the Army's business as you will readily observe, but as I have previously remarked there is no directing veterinary head to the Civil Veterinary Department. The Act was most simple, and was framed in such a manner that the susceptibilities of no Indian race would be offended. It was referred to the Provinces for opinion, and I hear that after a lapse of two years nothing has been done about it, that the time is not considered ripe for its adoption, or that the usual spectre of finance precludes its becoming law.

I have discussed this factor at some length, but I am convinced that it cuts at the very root of the incidence of anthrax in our own country both in man and animals. It is quite reasonable to expect that India, in these enlightened days, should follow the example of Great Britain, Ireland, Australia, New Zealand, Canada and South Africa.

In the actual handling of an anthrax situation in animals (as defined under the Anthrax Order of 1910) there are three main and indispensable factors to be observed: (a) Compulsory notification (such notification to be extended to sudden death without apparent reason); (b) compulsory disposal of carcases in accordance with defined procedure and prohibition of cutting up of carcases; (c) disinfection of surroundings.

The slaughtering of sick animals on farms and private slaughter-houses and the thoughtless and illicit disposal of carcases should be severely dealt with by law. And in the disinfection of ground it is a wise precaution (indeed, I consider it essential) to repeat the process—in other words, to practise what may be termed a fractional disinfection lest under the heat and moisture of the first disinfection a certain number of spores may have escaped destruction and have germinated.

The necessity for proper disinfection of raw material of wool, hair, hides and skins as a safeguard against human infection must be supported; but the disinfection should be carried out in the exporting country, the various international countries agreeing on this point to avoid dislocation of trade.

Effluents from tanneries and from horsehair and wool factories should be sterilized before entering a drainage system, and waste products and sweepings, generally, from these places should be prohibited from use as manure.

It is of course impossible satisfactorily to sterilize feeding stuffs for animals without destroying their properties. Linseed cake, which has so often been
blamed for anthrax, if properly manufactured, ought to be reasonably safe as it is brought to a temperature of 212°F. in manufacture. Cold pressed cakes should be discarded or used with caution. In any case proprietary or manufactured foods should be sold under a guarantee of purity and obtained from firms of repute. Indeed, the same may be applied to all imported food stuffs. However, it is certain that imported grains often owe their infection to ships having either previously, or at the same time, carried cargoes of hides, hair, wool and other animal products, and better attention should be paid to the cleansing of cargo vessels and to the safe disposal of waste material and sweepings.

Inoculation by vaccines for the prevention of the disease in animals is of little practical good, for immunity thus conferred only lasts about one year.