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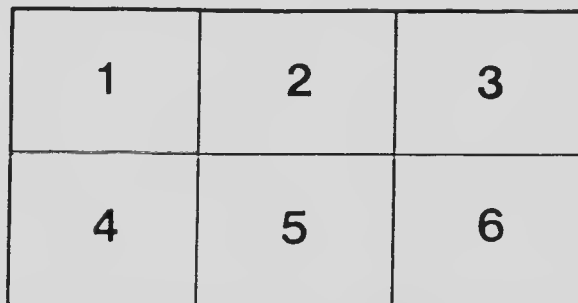
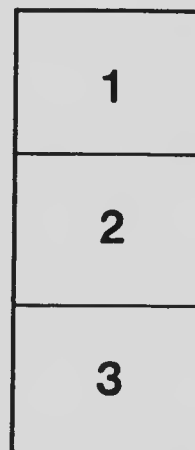
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HEALTH OF ANIMALS BRANCH

SPECIAL REPORT

—ON—

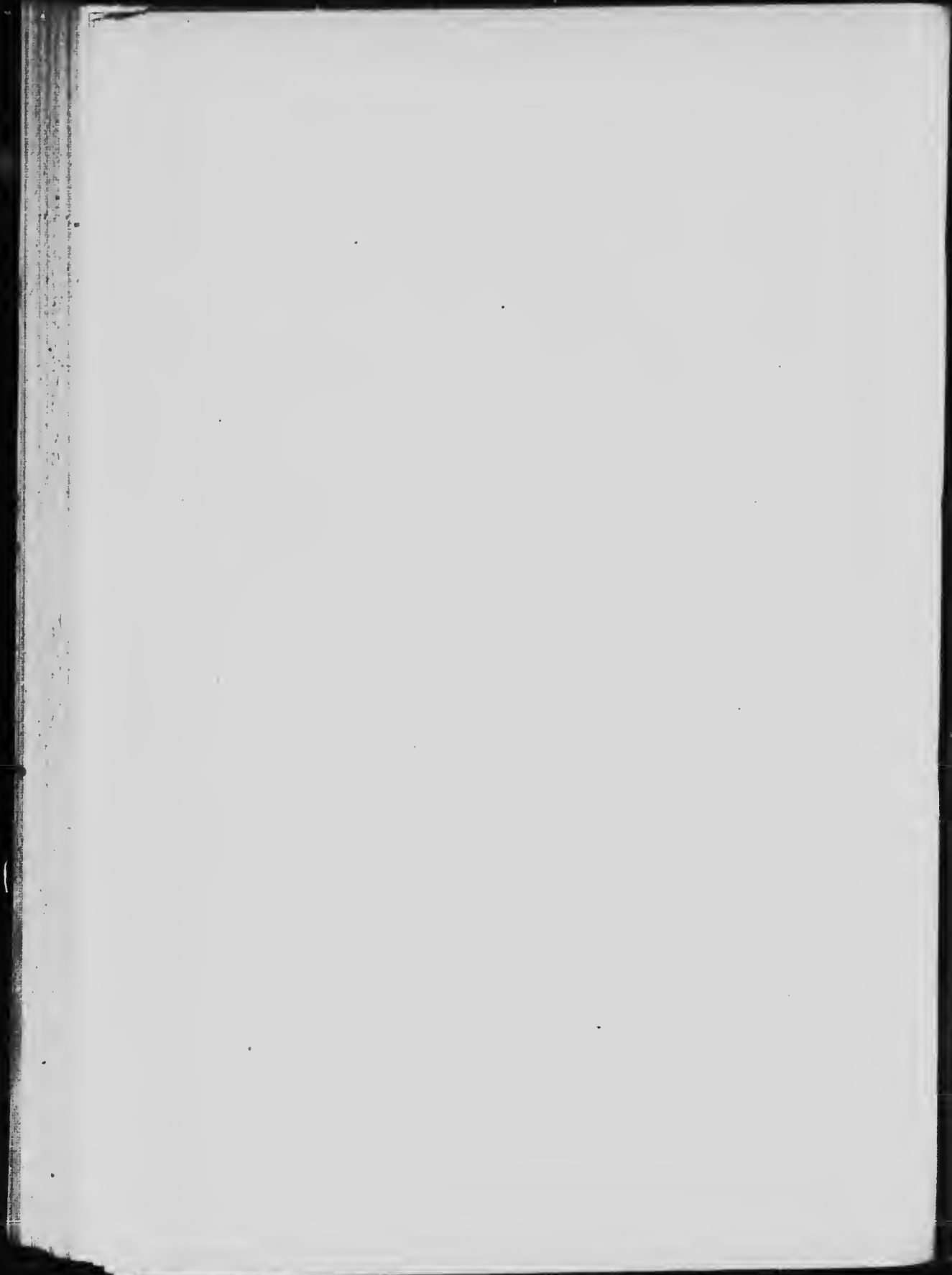
GLANDERS

—BY—

J. G. RUTHERFORD,

VETERINARY DIRECTOR-GENERAL AND LIVE STOCK COMMISSIONER.

SEPTEMBER, 1906.



SPECIAL REPORT ON GLANDERS.

Ottawa, September 1st, 1906.

Sir,—

I have the honour to present a special report upon the work performed during the last four years by this Branch of your Department in dealing with Glanders.

This disease has long been rightly looked upon as one of the most serious and dangerous of animal plagues, and even were there no recent striking developments, or rather circumstances, demanding special attention, a report of this kind would not be out of place.

As matters stand now, however, there are grave reasons for the careful summing up of the whole situation, and in my opinion for the serious reconsideration of the views held regarding the disease by a majority of the veterinary practitioners of this continent, and for a radical change in the attitude generally assumed by governmental bodies in dealing with it.

It is quite unnecessary to occupy your time by any dissertation on the general history and pathology of Glanders, or on the serious consequences not only to horses, but to human beings, which its continued existence in any community is liable to entail. It is equally needless to descant upon its prevalence on this continent and the importance of the adoption of an intelligent and comprehensive policy, having in view its immediate control and ultimate eradication.

As statistical and other details have been furnished in my various annual reports, I propose to confine myself to a brief history of our recent work in connection with the disease, followed by a short summary of the conclusions reached, on several points regarding which opinions, even to-day, differ somewhat widely.

It is almost exactly four years since the discovery of a serious outbreak of Glanders in the City of Ottawa rendered necessary a prompt decision as to whether the control of this disease was to be assumed by the Federal authorities, or left, as it had up till then been, except in the North-West Territories, and in the case of one or two isolated outbreaks elsewhere, in the hands of the Provinces.

After carefully considering my representations, you decided that it would be in the best interests of all concerned to bring the disease under the direct control of the Health of Animals' Branch of your Department. This was

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accordingly done, except in Manitoba, where, owing to the fact that the **legislation** had long been such as to enable the Provincial authorities to **deal with** it, if they chose to do so, in a most thorough manner, the work was not **taken over** by the Federal Government until 1905.

From August, 1902, until the present we have maintained a **continuous** effort to eradicate Glanders in the Dominion, a work, I may say, of **no small** difficulty, when the size of the country, its climate and the **conditions under** which horses are kept in many districts are taken into full consideration.

The discovery of Mallein in 1890 revolutionised entirely the **views of** veterinarians regarding Glanders. Older veterinarians well remember the formidable chain of symptoms, which, in their student days, were **considered** essential to a diagnosis of Glanders, as also the various ironclad rules to be followed in differentiating between it and that now somewhat dubious disease "Nasal Gleet."

It is now recognized that horses may be, and only too frequently **are**, seriously affected with Glanders while presenting, so far as outward and visible symptoms are concerned, an appearance of perfect health. The **knowl-**edge of this fact has, of course, necessitated a complete change in the **methods** of dealing with outbreaks of the disease. Whereas it was in former **years**, and in some countries is, even to-day, considered sufficient to **slaughter** animals showing clinical symptoms, while ignoring entirely those which **may** have been in contact, the conscientious modern veterinarian insists on the latter being submitted to the Mallein test, and if found to react, either **slaughtered** or segregated for observation and further tests.

In studs where clinical cases have occurred there is a strong likelihood that some of the contact horses will be found to be affected, although for a **time at** least they may present no external symptoms.

Any system, therefore, which ignores this frequent condition is **faulty and** likely to cause a dissemination of the infection, particularly when, as is **often** done, studs in which Glanders has been found to exist, are dispersed **among** innocent purchasers.

Under ordinary circumstances, especially when no provision for **reasonable** compensation exists, the problem presented by the condition outlined **above** is exceedingly difficult of solution. While horse owners, unless very **poor, very** ignorant or very unprincipled, are generally willing to have **clinical cases** destroyed, they quite naturally object to the slaughter of animals which **may** have reacted to Mallein, but show no evidence of disease and remain in **good** working order.

In some countries the authorities overcome the difficulty after a **fashion** by leaving the contact horses severely alone, thus avoiding the responsibility which would have to be assumed if the animals, on being tested, were **found** to react. Untested, they are presumably healthy and are left free from **restrictions**.

As an illustration of the results of pursuing a policy of this kind the **fol-**

lowing figures from the returns of the Board of Agriculture for Great Britain are very interesting:

1898	.....	1,385	horses	destroyed
1899	.....	1,472	"	"
1900	.....	1,858	"	"
1901	.....	2,370	"	"
1902	.....	2,073	"	"
1903	.....	2,499	"	"
1904	.....	2,628	"	"

It is not, however, necessary to go to Great Britain for proof of the folly of ignoring the contact horse. Similar object lessons are furnished by the conditions prevailing in more than one district in Canada, and while, of course, I cannot presume to speak authoritatively on these matters, I feel confident that in some of the United States of America Glanders is rapidly increasing owing to this cause.

The evil is greatly intensified by the fact that, where the proper authorities are inert, private testing of infected studs is continually going on, the reactors being subsequently sold as expeditiously as possible. Prominent veterinarians in Great Britain credit these private Mallein tests, conducted by unscrupulous owners through equally unscrupulous practitioners, with the notoriously rapid spread of the disease in that country during recent years.

The same thing is undoubtedly true in America, and here let me point out another condition which, taken in conjunction with the private test, constitutes an additional and very important factor in the spread of Glanders.

I refer to the great facility with which, in these modern days of cheap steam transportation, horses may be moved in large numbers from place to place.

While, especially in communities where mixed husbandry prevails, Glanders may never obtain a foothold, because in these districts horses from a distance are, with perhaps the exception of valuable and generally healthy breeding stock, but seldom introduced, I would remind you that the great fluctuations in the value of horse flesh during the decade just past have brought about the movement of large numbers of these animals from one district to another, and that Glanders has, beyond doubt, been extensively spread by this means.

Perhaps the most dangerous agents in thus disseminating Glanders are the western range horses, which, during the last ten years, have been distributed in large numbers through the country. Glanders on the range exists to a considerable extent in a latent and often very mild form, but it rapidly develops when the animals are broken, stabled and put to work. Many of the most widespread and most serious outbreaks with which we in Canada have had to deal are directly traceable to importations of range horses. Mallein is, of course, seldom used on the range but it is a common thing for owners to shoot down any clinical cases they may notice, the others, showing no symptoms, being sold as healthy, with the result above-mentioned.

Having made this digression in order to clear the way for what follows, I will, with your permission, revert to the time, when, in 1902, I was called upon to formulate a definite policy for the control of Glanders in the Dominion. At that time there existed no provision whatever for the payment of compensation, and this, of course, rendered quite impossible the slaughter of non-clinical reactors, even if I had then been anxious to adopt this radical policy.

As a matter of fact, however, I was, like many other veterinarians, under the impression obtained from a number of reliable professional sources, that it was quite unnecessary to kill horses of this class, and that satisfactory results would follow the adoption of a policy of testing all contacts with Mallein, and retesting from time to time such as reacted until they either ceased to react, or through repeated reactions, furnished conclusive evidence that they were incurable. For a period of slightly over two years this plan was carefully and conscientiously followed, but as time progressed it became evident that the results obtained were altogether disproportionate to the risk and labour involved. Not only did the number of horses on our hands keep constantly increasing, but in many cases individual reactors held among others for future tests developed clinical symptoms, and thus established fresh centres of infection. Such horses not only endangered the other reactors with which they were being kept, and some of which might have a possible chance of recovery, but indirectly threatened, through the various every-day channels which horsemen well understand, the health of other animals not actually housed with them.

As our opportunities for observation increased and further experience was obtained, serious doubts as to the conclusions previously reached by eminent veterinarians, both in Europe and America, as to the impossibility of Glanders being transmitted by reactors not showing clinical symptoms, or by ceased reactors began to assert themselves. As the work went on evidence gradually accumulated that many of the so-called ceased reactors were not only not permanently cured, but were properly to be looked on with grave suspicion as being likely to introduce Glanders among healthy horses with which they might be brought in contact. Several outbreaks of more or less severity and extent can be traced directly to these ceased reactors, and before I conclude, I shall endeavour to demonstrate the advisability of dealing with animals of this class as possible future centres of infection. As the owners of ceased reactors are generally more than willing to dispose of them as soon as possible after their release from official control, the risk of bringing infection to the stables of their unsuspecting purchasers constitutes an added danger which cannot reasonably be ignored.

The conclusion that neither non-clinical reactors nor ceased reactors could, with safety, be considered non-infective, having been thus forced upon me, there remained only two alternatives, either to follow the futile and already discredited policy of killing clinical cases and ignoring contact animals, or to face the situation and adopt the only intelligent course, namely, the destruction of all horses showing the typical reaction to Mallein whether presenting any external manifestations of Glanders or not.

I need scarcely say that this would have been absolutely impracticable without provision for the payment of liberal compensation. The question of compensation for the slaughter of diseased animals has always, and in all countries, been one of great difficulty, and the disinclination of those in authority to assume the financial outlay involved, has been one of the chief obstacles encountered by veterinary sanitarians engaged in dealing with animal plagues.

When, however, the situation was clearly laid before you, you did not hesitate to ask Parliament for the needed authority, and the no less necessary funds, with the result that in September, 1904, we were enabled to begin the slaughter of reactors and to pay for them at a reasonable, and when their intrinsic value is considered, a most liberal rate.

From September, 1904, to March, 1905, compensation was paid for non-clinical cases only, but it was soon seen that in order to avoid friction, as well as to secure prompt notification of outbreaks, it would be necessary to pay for all animals slaughtered, whether visibly affected or not. On March 25th, 1905, therefore, the following regulations came into effect:



DOMINION OF CANADA.

REGULATIONS RELATING TO GLANDERS.

By Order in Council dated 25th March, 1905, in virtue of "The Animal Contagious Diseases Act, 1903."

1. No animal which is affected with or has been exposed to Glanders shall be permitted to run at large or to come in contact with any animal which is not so affected.
 2. Any Veterinary Inspector may declare to be an infected place within the meaning of the "Animal Contagious Diseases Act, 1903," any steamship, or steam or other vessel, or any place or premises where the contagion of Glanders is known or suspected to exist.
 3. No horse, mule or ass shall be removed out of an infected place without a license signed by an Inspector.
 4. Veterinary Inspectors are hereby authorized to inspect and to subject to the Mallein test any horses, mules or asses affected with Glanders or suspected of being so affected, or which have been in contact with animals so affected, or suspected of being so affected, or which have been in any way whatsoever exposed to the contagion or infection of the disease of Glanders, and for the purpose of making such inspection or test to order any such animals to be captured, detained or isolated.
- Horses, mules or asses affected with Glanders, whether such animals

show clinical symptoms of the disease, or react to the Mallein test without showing such symptoms, shall on an order signed by a duly appointed Inspector of the Department of Agriculture, be forthwith slaughtered and the carcasses disposed of as in such order prescribed, compensation to be paid to the owners of such animals if and when the Act so provides.

6. In the event of the owner objecting to the slaughter of animals which react to Mallein, but show no clinical symptoms of Glanders, the Inspector may order such animals to be kept in close quarantine and retested, such retests however in no case to exceed two in number and to be completed within four months of the first test, provided, however, that owners deciding to have their animals quarantined rather than slaughtered shall forfeit all right to compensation.

7. Horses, mules or asses reacting to the third test with Mallein shall be forthwith slaughtered on an order signed by an Inspector and the carcasses disposed of as ordered.

8. Inspectors are hereby authorized to permit owners of horses, mules or asses which give no reaction to the third test with Mallein and which have at no time shown any clinical symptoms of Glanders, to retain and use such animals, subject to the conditions contained in the license signed by the Inspector.

9. Before an order is made for the payment of compensation in any of the cases aforesaid, there must be produced to the Minister of Agriculture a satisfactory report, order for slaughter, certificate of valuation and slaughter, and certificate of cleansing and disinfection, all signed by an Inspector.

10. The certificate of an Inspector to the effect that an animal has reacted to the Mallein test or has shown clinical symptoms of Glanders, shall, for the purpose of the said Act and of this order be prima facie evidence in all Courts of Justice and elsewhere of the matter certified.

11. Every yard, stable, outhouse or other place or premises, and every waggon, cart, carriage, car or other vehicle, and every utensil or other thing infected with Glanders shall be thoroughly cleansed and disinfected by and at the expense of the owner or occupier, in a manner satisfactory to a Veterinary Inspector.

J. G. RUTHERFORD,

Veterinary Director General.

Department of Agriculture,
Ottawa.

Although the time which has elapsed since the inauguration of the policy of compensation and slaughter is altogether too short to enable us to form a definite and decided opinion as to its wisdom and probable effectiveness in securing the eradication of Glanders, the following figures furnish convincing proof that it has a strong tendency to remove the disinclination generally

evinced by owners to report outbreaks of the disease and to permit the slaughter of their horses:

	Tested.	Reacted.	Killed.	Clinical.
1902-3.....	1,062	466	219	219
1903-4.....	1,387	420	499	499
Inclusive of Manitoba { 1904-5.....	4,899	1,854	2,113	932
{ 1905-6.....	3,957	1,285	1,387	561
{ (to March 31)				
{ 1906-7.....	4,200	850	946	502
{ (to Aug. 31st)				
Total.....	15,505	4,875	5,164	2,713

In considering these figures I desire particularly to draw your attention to the large increase, not only in the numbers of those tested and killed as reactors, but of those showing clinical symptoms. These figures furnish incontrovertible evidence that the present system brings to light a very large number of cases of Glanders, which, without provision for payment of compensation, would never have been reported.

Under the conditions formerly existing, there was a tendency on the part of owners, and doubtless of some veterinarians, to avoid trouble and loss by concealing the existence of Glanders. Where no compensation is paid many owners, otherwise quite respectable, are undoubtedly in the habit of allowing clinically affected cases to run their course, working them as long as possible, and finally either permitting them to die or having them quietly destroyed; while those less honest or more unprincipled have no hesitation in subjecting them to palliative treatment, with a view to removing or concealing suspicious symptoms, and subsequently disposing of them to the best advantage.

I am satisfied that the system now followed in Canada will, by removing temptation, prove effective in overcoming, at least to a very large extent, these tendencies shown by depraved human nature under less favourable circumstances.

It is interesting to note the manner in which the new regulations are received in different parts of the Dominion. In districts where the disease has prevailed to any considerable extent and where horse owners realize its serious nature and the importance of stamping it out, the new order of things is heartily welcomed. On the other hand, in places where the people are comparatively unfamiliar with Glanders, the new regulations are looked upon as unnecessarily severe, and people complain bitterly that their horses are being slaughtered without good and sufficient reason. The claim is made that our inspectors destroy more horses than the disease itself would ever be likely to kill, the argument being advanced that only a very limited number of horses are free from Glanders under ordinary conditions, and that the disease seldom or never becomes epizootic.

Facts, however, are entirely against this contention. The figures already noted from the returns of the Board of Agriculture of Great Britain indicate

that, under modern conditions, the disease, unless properly controlled is certain to spread rapidly and to cause a constantly increasing loss in horse flesh.

As an illustration of this I would quote from our own experience the case of one Canadian Lumber Company in a remote part of the country which reported last year for the first time the existence of Glanders among its horses. Enquiry elicited the fact that in less than four years upwards of fifty head of valuable horses owned by this Company, had died of Glanders. Of thirty-six survivors, thirty-four reacted to Mallein and were destroyed. Of the two remaining, neither had been in contact with the diseased horses.

We have a number of similar cases on record, but it would scarcely be possible to furnish a better illustration of the evil results certain to follow carelessness or neglect in dealing with Glanders.

In this connection I cannot refrain from quoting an extract from the London "Lancet" of July 5th, 1905, which, in a review of the Report of the Board of Agriculture, speaks as follows:

"Glanders is admittedly on the increase, and it is time that some radical measures were taken to control the disease. In 1894 there were only 502 outbreaks reported, but in 1904 these had increased to 1,539, and 2,658 horses were killed as glandered. More power ought certainly to be given to the veterinary inspectors to test the in-contact horses with Mallein, as by this agent an almost infallible diagnosis can be made within 24, or at most 48 hours. The expense, although great the first year, would not be excessive if allowed to spread over a period of years; and where a preventable disease, which also causes the deaths of numbers of human beings each year, is concerned, the cost ought certainly not to be considered too seriously as the reason why it should not be taken thoroughly in hand."

It is gratifying to note that the British authorities are being urged to introduce the identical policy which we have already adopted in Canada.

While dealing with this phase of the subject, I would point out that if the adoption of our system is deemed necessary in a small country like Great Britain, where police and inspection work has been reduced to a science, there can be no doubt of the wisdom of its adoption in the Dominion of Canada, where the distances are magnified and the population, especially in some districts, sparse to a degree, although I am glad to say that the last named condition is being rapidly altered by the constant influx of desirable settlers who are coming from all parts of the world, but perhaps in greatest number from the Western United States.

In this connection I would say that while we do not think it necessary to test the human immigrants from that country, I think it altogether likely that we will be compelled, in the near future, to impose this precautionary restriction upon those of the equine species, as the records in our possession indicate that a considerable number of the outbreaks of Glanders in Western Canada are due to imported American horses, of which we have for a number of years back been absorbing from twenty-five to thirty thousand head per annum.

Having now indicated, perhaps at too great length, our present attitude

in relation to Glanders, I would like to lay before you, as briefly as possible, some of the facts brought to light in the course of our work which have convinced us that in the war against Glanders no quarter should be given to the typical reactor, whether he shows clinical symptoms or not.

I have already given you some figures as to the number of horses with which we have dealt during the last four years. In connection with what I am about to say, however, I would call your attention to the fact that up till Aug. 31st, 1906, we have tested 15,505 horses, and have actually made 18,117 Mallein tests.

The marked disproportion between the number of horses tested and the number of tests made is attributable to the fact that from 1902 to 1904 we, as already stated, followed a retesting policy. It will, I think, be conceded that the number of tests made, each of which was carefully reported, is sufficient to furnish a reasonable basis for definite and intelligent opinions on the various points relative to Mallein, its uses, effects and the conclusions which may reasonably be drawn therefrom.

While perhaps to some extent reversing the natural sequence of events, I propose to refer first to the danger inseparable from the keeping alive of ordinary non-clinical reactors. With regard to this point, I am not in a position to furnish any great amount of statistical information for the reason that from the very beginning of our present operations animals of this class falling into our hands have been, except in the case of a few which early became ceased reactors, so dealt with as to prevent the possibility of their coming into contact, direct or indirect, with healthy horses.

When engaged in private practice, however, I had an opportunity of forming an opinion on the subject, for although, after the use of Mallein was adopted, which, with me, was in the year 1893, I invariably advised my clients to destroy all typical reactors, the law did not make their slaughter compulsory and many were permitted to live. Not a few subsequent outbreaks of which I was cognizant were undoubtedly due to the retention and distribution of infection by these apparently healthy animals.

As a matter of fact, there has never been, at least among intelligent and single-minded veterinarians, any great tendency to belief in the harmlessness of horses which continue to give typical reactions to Mallein, even when they present no visible symptoms of Glanders. The Departmental Committee appointed in 1901 by the Board of Agriculture of Great Britain for the purpose of conducting experimental investigations with regard to this and kindred subjects, reached the conclusion that these apparently healthy reactors are capable of transmitting Glanders. The Committee in question, comprised the late Mr. A. C. Cope, Mr. Wm. Hunting, Sir John McFadyean and Dr. James McI. McCall, all men of high professional attainments and great experience in dealing with Glanders. One of the points dwelt upon by them, viz., the suddenness with which a reactor may become clinically glandered, is worthy of special note. Our experience in Canada has demonstrated beyond question the danger arising from this liability of reactors to suddenly develop acute

symptoms, and has shown further that a considerable proportion of these superficially healthy animals are in reality clinical cases.

As under our present regulations such horses are slaughtered, opportunities for post mortem examination have not been wanting, and in many cases showing absolutely no external symptoms, extensive ulcerations have been found high up in the nasal passages, while the presence in this situation of minute nodular lesions, undoubtedly specific, has been strikingly frequent. These discoveries bear out the opinion which I have long held and frequently expressed regarding the importance, from an infective point of view, of enlarged sub-maxillary glands in reacting animals. There is never smoke without fire, and these glands are not likely to show tumefaction without a definite pathological reason.

Leaving nasal lesions aside, it is well known that in typical reactors glanders nodules are invariably found in the lungs, and not unfrequently in other organs, although the tendency to localization in the lymph nodes, so common in bovine tuberculosis, is much less frequently noted in Glanders.

Again, I would remind you of the days before Mallein was heard of, when, in spite of all our efforts and precautions, case after case, and outbreak after outbreak, of Glanders would occur in the same stable. After each fresh outbreak the most thorough disinfection was practised, and all the surviving horses subjected to careful scrutiny and continued close observation. Six months, or perhaps a year would elapse and then another case or series of cases would occur. We blamed the stables, we thought the contagion, or, as we then called it, the virus, was immortal and indestructible. Now we know that, outside of the animal body, the life of the bacillus mallei is, under the most favourable conditions, limited to three or four months. In the animal body it is a different matter, and the cause of the mysterious recurrent outbreaks was the chronic latent case of Glanders, then unrecognized, but now, through the agency of Mallein, marked down and known as a reactor.

In tracing the origin of primary outbreaks in hitherto uninfected localities, we almost invariably find that the disease has been introduced not by a well marked case of Glanders, but by a non-clinical contact horse, often a reactor, generally purchased by an unsuspecting farmer ignorant of the fact that his new bargain has recently come from an infected district and possibly from a badly infected stud.

Further evidence against the reactor will be incidentally adduced in the notes which I am about to lay before you regarding his close connection, the so-called ceased reactor.

Ceased reactors so called should, in the light of our experience, be divided into three distinct classes:

1. Those which, while not properly reacting to Mallein, are, owing to a slight thermal rise or a septic infection, more or less serious at the point of injection, erroneously classed as reactors by the veterinarian making the test.
2. Actual ceased reactors, comparatively few in number, and almost

invariably, in our experience, consisting of horses tested when in the incipient stages of Glanders, or at any rate when but slightly affected, as evidenced by the fact that their original reactions, though typical, are not as well marked either thermally or locally, as those given by clinical cases or by these animals which, while perhaps not showing external symptoms, are suffering from the disease in an advanced form.

3. Those which having on one or more occasions definitely reacted develop an acquired tolerance to the test, the latter being, however, of a temporary character, so that after the lapse of a varying period, generally from six to twelve months, a typical reaction again follows the injection of Mallein.

The first-mentioned class are of but little importance, and demand no attention at our hands beyond a due consideration of the part they have already played, and doubtless will for some time continue to play, in promoting bootless discussion, and thus, to some extent, retarding the general adoption of Mallein as an authoritative diagnostic agent.

The various causes which contribute to their being wrongly classified as reactors will, however, be shortly dealt with when we take up the question of reactions typical and atypical.

The second class is naturally much more interesting, consisting as it does of horses which actually overcome the infection of Glanders either through the action of Mallein or by the efforts of nature unaided, or at least aided only by favourable physical conditions.

We have in Canada under supervision at present a considerable number of horses which have at one time or another, during the past four years, given a typical reaction to Mallein, but which are now, so far as we can ascertain by periodical inspection and repeated testing, absolutely free from Glanders. These animals, however, constitute a lamentably small proportion of the total number which reacted without showing clinical symptoms in the two years during which we followed the retesting system. Two years ago I stated that about 25 per cent. of our non-clinical reactors had ceased to react, and were apparently free from Glanders. At that time I expressed my great disappointment with the small return which this percentage gave for the risk and labour involved in carrying on the retests, and announced that it was our intention to discontinue that method of dealing with Glanders and adopt the plan which we are now following.

I am sorry to have to tell you that in classing all these horses as safely ceased reactors we were seriously in error. During the intervening period a considerable number of them have rejoined the reacting ranks, and have been condemned as diseased. There are still, however, a number which have continued to stand not only the Mallein test, but the test of time. These give absolutely no indication of being other than healthy horses, and thus, so far as can be seen at present, there is no reason to doubt that, in a proportion of comparatively mild cases of Glanders, recovery may and does take place.

We have found, moreover, that while it is not by any means possible to tell at the first, or even at the second test which of the affected horses will

eventually become permanent ceased reactors, we can at one or other of these stages make reasonably certain of those which will not do so.

Animals which, on being first tested, show a thermal rise exceeding 104° Fahrenheit, accompanied by a characteristic reaction, those which give a more pronounced reaction to a second or subsequent test than they do to the first, and those which suddenly cease to react without showing a gradual lowering of the temperature and a corresponding abatement of the local reaction are not likely to become permanent ceased reactors.

Sound pathological reasons can, I think, be advanced for the lack of improvement shown by the first and second classes, but I must confess that I have no mental theory to fit the case of those last mentioned.

Having now dealt with the supposititious ceased reactors and with those which appear to make an actual and permanent recovery, it becomes our duty to discuss those animals, and they are, in our experience, by far the most frequently encountered, and, needless to say, the most dangerous, which acquire a temporary tolerance to Mallein, but which again give a definite reaction when tested, after sufficient time has elapsed to nullify the effects of previous injections. In the report of the Special Committee appointed by the British Board of Agriculture, to which I have already referred, the records given indicate that all the ceased reactors dealt with in the experiments showed an abnormally high temperature when tested with Mallein some time after they had apparently ceased to react. I considered this a very suspicious circumstance, and one which furnished food for serious thought. In order to discover, if possible, the reason of this peculiar phenomenon I determined to again submit to the Mallein test a number of horses which had been kept for varying periods under supervision as ceased reactors. The results were very interesting, as may be gathered from the following examples from the report of Dr. A. E. Moore, one of our most careful and capable officers, who was entrusted with the task of conducting the investigations. The pathological work was, of course, done by Dr. Higgins.

Results of post mortem examinations conducted on ceased reactors which again reacted on being tested, after a period of not less than six months:

Paddy, Grey Gelding, 16 Years, No. 304.

	Max. temp. before inject.	Max. temp. after inject.	Max. size swelling
1st test, May 22, 1903	100 4-5	105	6x6
2nd test, June 7, 1903	100 2-5	105 2-5	4x5
3rd test, Sept. 7, 1903	100 2-5	101 2-5	2x3 ceased
4th test, Oct. 25, 1903	101	101	3x4
Retest after 1 year and 2 months, Dec., 1904	101 2-5	104	3x6
Result of post mortem of No. 304:			

Very few nodules scattered in the lungs, around some of these nodules small quantity of lymph-like substance was seen, others encysted.

Five guinea pigs were inoculated, and from the organs of one a pure culture of bacillus mallei was obtained.

Jerry, Grey Gelding, aged, No. 307.

	Max. temp. before inject.	Max. temp. after inject.	Max. size swelling
1st test, June 6, 1903	100 4-5	105 4-5	3x4
2nd test, Aug. 20, 1903	101	104	2x2
3rd test, Nov. 19, 1903	100 4-5	104	3x3
4th test, Feb. 26, 1904	101 2-5	101 1-5	2x2 ceased
Retest, after 9 months, Nov. 15, 1904..	100 2-5	104 2-5	3x4

From 20 to 30 small nodules seen in lungs from the size of a pea to small bean, several places in right lung showing cicatricial tissue, all the nodules were deep seated, mostly encysted, and followed the large bronchial tubes. Three guinea pigs inoculated and from one bacillus mallei was isolated in pure culture.

Nance, Grey Mare, 8 Years, No. 308.

	Max. temp. before inject.	Max. temp. after inject.	Max. size swelling
1st test, March 10, 1903	101 1-5	104 3-5	4x4
2nd test, June 6, 1903	101	105	6x8
3rd test, Aug. 20, 1903	99 2-5	104 1-5	6x6
4th test, Nov. 19, 1903	100 1-5	102 1-5	5x6
5th test, Feb. 2, 1904	100 4-5	101 1-5	3x3 ceased
Retest, after 9 months, Nov. 15, 1904..	100 3-5	104 3-5	4x4

About ten very small nodules encysted, all deep seated in the lungs and near the bronchial tubes.

Two guinea pigs were inoculated 7-12-'04. They were still thrifty 8-6-'05, and had gained considerably in weight. They were chloroformed, no lesions found and cultures remained sterile.

Doll, Bay, White Face, 9 Years, No. 309.

	Max. temp. before inject.	Max. temp. after inject.	Max. size swelling
1st test, March 23, 1903	99 1-5	104 1-5	2x2
2nd test, June 6, 1903	100 2-5	105 1-5	4x8
3rd test, Aug. 8, 1903	100 4-5	104 4-5	4x5
4th test, Nov. 19, 1903	100 3-5	102 4-5	4x5
5th test, Feb. 26, 1904	101	101	2x2 ceased
Retest, after 9 months, Nov. 15, 1904 ..	101	103 2-5	3x3

Bronchial and mediastinal glands slightly enlarged. About twenty small nodules (pea) were found in the lungs, sixteen in the right lung and four in the left. Mostly encysted. Three guinea pigs were inoculated, and from one bacillus mallei was isolated in pure culture.

Mag, Black Mare, 10 years, No. 310.

	Max. temp. before inject.	Max. temp. after inject.	Max. size swelling
1st test, May, 5, 1903	102	104 2-5	2x6
2nd test, Aug. 6, 1903	100 1-5	104	3x3
3rd test, Nov. 19, 1903	100 2-5	104 2-5	3x3
4th test, Feb. 20, 1904	100 2-5	100 4-5	2x3 ceased
Retest, after 9 months, Nov. 15, 1904..	101	103 2-5	3x3

About 15 very small nodules found in lungs, all deep seated, and following the main bronchial tubes, mostly encysted.

Three guinea pigs inoculated 7-12-'04. From one pure cultures of bacillus mallei were obtained.

In all these autopsies there was noted the peculiar injected appearance of the lungs which is seen when a reacting animal is destroyed immediately after testing. In all but one of these five ceased reactors a pure culture of the bacillus mallei was obtained. In this case the lesions found were characteristic and it is probable that the bacilli were present. Only two guinea pigs were used for this inoculation.

The following very striking record is that of a horse which has ceased to react no less than three times in the course of the last three years. This animal is still isolated under close supervision, and although performing ordinary farm work daily, is in the pink of condition, and, to all outward appearance, absolutely healthy:

King, Bay Gelding.

	Max. temp. before inject.	Max. temp. after inject.	Max. size swelling
1st test, Aug. 26, 1903	101	105	2x4
2nd test, Nov. 19, 1903	100 2-5	104 1-5	4x4
3rd test, Feb. 26, 1904	100 2-5	103 1-5	2x2
4th test, June 9, 1904	101 1-5	101	2x2
5th test, July 5, 1904	101 1-5	101	3x3
6th test, Nov. 14, 1904	101 1-5	104 1-5	3x4
7th test, April 7, 1905	101 1-5	101	2x2
8th test, Nov. 1, 1905	100 4-5	104 4-5	4x4
9th test, July 7, 1906	100 4-5	101	2x3

I append here three tables showing the different results obtained in testing: 1st, horses which have become permanent ceased reactors; 2nd, horses which after having once ceased to react, have again given a characteristic reaction to Mallein after a period of from six months to a year; and 3rd, horses which have shown no improvement when tested at intervals of 30, 60 and 90 days, although never developing clinical symptoms.

12 Horses which did not show any improvement by injection of Mallein at intervals of about 30, 60 and 90 days. Although never developing any clinical symptoms.

No	Maximum Temperatures at:				Maximum size of Swelling at :-				
	1st Test	2nd Test	3rd Test	4th Test	1st Test	2nd Test	3rd Test	4th Test	
1	Brown gelding, 13 yrs.	105 4-5	105 2-5	105	104 3-5	2x3	4x4	3x4	4x4
2	Bay mare, 10 yrs.	106 2-5	106 2-5	106 1-5		4x6	2x5	6x8	
3	Bay gelding, 8 yrs.	106	105 4-5	105		3x4	5x8	5x6	
4	Roan " 11 yrs.	106 1-5	105 1-5	104 1-5	105 3-5	3x7	4x5	3x5	5x7
5	Chestnut " 14 yrs.	103 1-5	105 2-5	104 3-5	105 2-5	3x6	4x6	5x6	6x6
6	Black " 9 yrs.	105 2-5	105 2-5	105		4x5	3x5	4x5	
7	Bay mare, 9 yrs.	105 4-5	105 1-5	105 3-5		6x7	6x6	6x8	
8	Black gelding, 13 yrs.	105	105 2-5	105 2-5		3x4	2x3	4x7	
9	Brown " 10 yrs.	104	105 4-5	105		6x8	5x5	2x3	
10	Bay mare, 7 yrs.	105 3-5	104 2-5	103 2-5	105 2-5	1x1	3x6	3x4	2x2
11	Bay gelding, 12 yrs.	105 2-5	105 4-5	104 4-5		1x3	2x3	2x3	
12	Chestnut " 8 yrs.	104 4-5	103 2-5	104 1-5	105 2-5	4x6	6x6	2x3	5x6

12 Horses which became ceased reactors and did not react again at the end of periods varying from six months to one year and a half; retested at intervals of about 30, 60 and 90 days. Never showed clinical symptoms at any time.

No.	Description	Maximum Temperatures at :—					Maximum Swellings at :—					REMARKS			
		1st Test	2nd Test	3rd Test	4th Test	5th Test	1st Test	2nd Test	3rd Test	4th Test	5th Test				
1	Brown gelding, 10 years	105	105	103 1-5	100 4-5	101 4-5	3X4	3X5	5X6	1X2	2X2	2X2	2X2	10	Retested 17 mths after ceasing to react
2	Black mare, 9 years	104	103 2-5	102 2-5	102	101	2X2	4X6	2X6	2X3	1X2	1X2	1X2	17	
3	Black gelding, 11 years	104 1-5	102	101	100 2-5	101 4-5	1X2	2X2	1X3	1X1	2X3	1X1	2X3	17	
4	Bay gelding, 8 years	103	102 2-5	101 4-5	101 1-5	101 3-5	1X2	1X1	3X4	2X2	3X3	2X2	3X3	17	
5	Black mare, aged	104 1-5	105	101 3-5	100 2-5	102 1-5	2X2	2X3	2X3	2X3	2X3	2X3	2X3	17	
6	Bay gelding, 9 years	104 3-5	103 4-5	103	101 2-5	100 2-5	3X6	3X4	3X4	3X3	3X3	3X3	3X3	17	
7	Bay mare, 10 years	104 1-5	101 2-5	100 3-5	100 2-5	102 1-5	6X8	2X3	2X3	2X3	1X2	2X2	2X2	17	
8	Roan gelding, 10 years	103 4-5	102 1-5	101	100 4-5	101	1X1	2X3	1X1	none	1X3	1X3	1X3	12	
9	Brown gelding, 10 years	104 3-5	104	103 1-5	101 2-5	102	2X2	2X2	1X2	1X2	1X1	2X3	2X3	17	
10	Chestnut gelding, aged	103 3-5	103 4-5	101 3-5	100	101 -25	1X3	1X1	2X4	2X3	2X3	2X3	2X3	17	
11	Bay gelding, 6 years	104 3-5	102 1-5	100 4-5	101 1-5		4X5	3X6	2X3	2X2	2X2	2X2	2X2	7	
12	Bay mare, 6 years	104 2-5	102 3-5	101 1-5	101 2-5		3X3	2X3	2X3	2X2	2X2	2X2	2X2	9	

Horses which became ceased reactors, but on being retested after an interval of from six months to a year and a half, again gave a characteristic reaction.

No	Description	Maximum Temperatures at :—										Maximum Size of Swellings at :—										Remarks				
		1st Test	2nd Test	3rd Test	4th Test	5th Test	6th Test	7th Test	8th Test	9th Test	1st Test	2nd Test	3rd Test	4th Test	5th Test	6th Test	7th Test	8th Test	9th Test							
1	Bay gelding, aged	106	104 1-5	100 4-5	104 2-5																					
2	Black mare, 10 years	104 2-5	104	104 2-5	100 4-5	103 2-5																				
3	Grey gelding, aged	105 4-5	104	104	101 1-5	104 2-5																				
4	Bay gelding, aged	106 1-5	106	103 1-5	102	104 1-5																				
5	Grey mare, aged	105 4-5	105 3-5	103 3-5	100 1-5	104 3-5																				
6	Grey gelding, 16 yrs.	105	105 2-5	101 2-5	101	104																				
7	Grey mare, 8 years	104 3-5	105	104 1-5	102 1-5	101 1-5	104 3-5																			
8	Bay mare, 9 years	104 1-5	105 1-5	104 4-5	102 4-5	101	104 2-5																			
9	Chestnut geld., 18 yrs	104	103 1-5	100 2-5	100	104 2-5																				
10	Bay gelding, 15 yrs	104 1-5	103 1-5	100 2-5	100	104 2-5																				
11	Bay gelding, 7 yrs	105	104 1-5	103 1-5	101	104 1-5	102 2-5	101	104 4-5																	
12	Bay gelding, 12 yrs	104 2-5	105 1-5	105	103	101 2-5	103 3-5	101 4-5	104 3-5	104 4-5																

Caused to re-act to test
Caused to re-act to test
Caused to re-act to test

I do not think it necessary to make any extended comment on the facts brought to light by this series of retests. So far as the possibility of the latter reactions being due to reinfection is concerned, I would say that this danger was fully considered and guarded against. If reinfection occurred in any of these cases it was through one or other of the so-called ceased reactors, and not from any outside source.

I may add that while the work performed by Dr. Moore was the most systematic and thorough of any which we undertook on similar lines, the results obtained by him were corroborated by like retests conducted by other officers in various parts of the Dominion.

Further proof of the dangerous character of these horses, which, through an acquired tolerance to Mallein, are erroneously classed as ceased reactors, is, I am sorry to say, furnished by our own official records, several instances having occurred in which horses held under supervision for periods deemed sufficient to ensure safety, were permitted to mingle with healthy animals, with disastrous results.

Not the least remarkable feature of these cases is the fact that they seldom develop clinical symptoms themselves, although, beyond doubt, many of them are capable of transmitting infection to others.

This report has already exceeded a reasonable length, but I cannot well close without giving the consensus of opinion arrived at by our inspectors as to what constitutes an actual and typical Mallein reaction. Ability to differentiate with certainty, at least in the majority of cases, between typical and non-typical reactions, is, for obvious reasons, perhaps the most important factor in the use of Mallein.

We are fortunate in having on our inspection staff a number of careful and closely-observant men, and the results of their experience have been condensed as follows:

In horses affected with Glanders from the 4th to the 15th hour after the injection of the usual dose of reliable Mallein a distinct rise of temperature takes place, except in certain cases which will be specially mentioned later. The temperature gradually rises until the 14th or 15th hour after injection, when, after remaining at about the same height for a longer or shorter period, it gradually declines, the downward course being not unfrequently preceded by a slight secondary elevation.

This thermal disturbance should, under ordinary circumstances, indicate a rise of at least 2.5 degrees Fahrenheit over the highest control temperature taken before injection. The wide variation in normal temperature shown by the equine species, especially in Western America, demands the application to this rule of certain definite limitations. For instance, if invariably followed, a horse having a pre-injection temperature of, say, 99°, would be condemned at 101.5°, which might be well within his normal range. On the other hand, an animal with a pre-injection temperature of 102°, which is not at all strikingly

abnormal in the west, would be allowed to reach without condemnation 104.4° , a point entirely outside of the normal range.

Other things being equal, 103° Fahrenheit would appear to indicate the danger line, but no fixed rule can possibly be adopted, close observation and sound judgment in the operator being of more importance than hard and fast ruling.

The thermal rise is accompanied, or rather followed, by a hard, tense and exceedingly painful swelling at the point of injection. This swelling is usually circular, and shows a tendency to increase from the eighth hour after injection, at the same time becoming more painful, affecting the muscles and causing marked lameness in the forelimb of the side on which the injection was made. It is often accompanied by swelling of the surrounding lymphatics, which also become intensely painful.

The local reaction does not, as a rule, entirely disappear for several days.

Besides the thermal and local reactions Mallein produces well marked constitutional effects on animals suffering from Glanders. The pulse and respiration are increased, rigors are frequent, sometimes slight, but occasionally violent, and continuing throughout the whole reaction. There is great depression, while loss of appetite, staring coat and disinclination to move are also commonly noted.

In clinical cases reaction is, as a rule, early and well marked, and most of our inspectors agree that the severity of the reaction is in direct ratio to the degree of infection or the stage which the disease has reached. Clinical symptoms not unfrequently make their first appearance during the test, generally from 24 to 30 hours after injection. In advanced cases they may persist, the animal rapidly breaking down, while in incipient cases they may gradually recede, the animal regaining a normal and comparatively healthy appearance. Clinical symptoms already evident, are almost invariably aggravated by the test. One especially noteworthy feature is that in animals showing only a slight enlargement of the submaxillary lymphatic glands, these will become tense, swollen and painful as the test progresses. This also applies to other enlarged nodes. Dr. Moore describes one case in which both inguinal glands, slightly enlarged before the test, became, during its progress, so much swollen and so painful that the animal could scarcely walk. Post mortem revealed specific lesions in both glands.

Occasionally all evidences of reaction are present, except the thermal rise, while in others the opposite is the case, and it may be noted that these eccentricities are not unfrequently shown by all the horses tested in certain outbreaks, and further that they persist throughout repeated tests of the same animals, although, under ordinary conditions, the local reaction has a tendency to become less well marked with each succeeding test.

In animals in the last stages of Glanders, old horses, young foals and others of inferior vitality, a lowering of temperature not unfrequently follows the injection of Mallein. This is especially noticeable in advanced cases where

the temperature is high at the time of injection. In actual outbreaks, contact horses, even when showing no clinical symptoms, but having a high initial temperature, dropping or remaining stationary after injection, should be condemned, especially when a local reaction occurs.

In fact it may be laid down as a general rule that a typical local reaction is proof positive of the existence of Glanders, even when no thermal disturbance takes place.

There is not, as a rule, much difficulty in distinguishing between a typical and a non-typical reaction. The former has been already described. In the latter the thermal rise seldom exceeds 2° , and reaches its greatest height at or before the 12th hour, returning to normal before the 20th hour.

The swelling, when circular, rarely exceeds three inches in diameter. It is only slightly painful, is quite superficial, soft and moveable, does not increase after the 8th hour, and is rapidly absorbed during the course of the second day. It never affects the action of the muscles, nor does it cause lameness. Sometimes a fluctuating dependent swelling of considerable size follows a careless or unskillful injection, but this, as a rule, is absorbed rapidly during the first 24 hours.

With ordinary precautions septic infection seldom takes place, and abscess formation is rare except in typical reactors, when it is not uncommon. Occasionally considerable swelling, sometimes accompanied by a thermal rise, will occur in horses suffering from influenza and similar affections. Such so-called reactions are not typical, and should not be ascribed to the action of Mallein, but to the already existing febrile condition of the animal.

Cases sometimes occur in which, at the end of 24 hours after injection, neither thermal nor local conditions are sufficiently definite to enable the veterinarian to reach a decision. In these circumstances the animal should be kept under close observation for a further period of 24 hours, when, if it is diseased, the increased swelling and marked lameness which almost invariably follow will remove any possible doubt. Suspected cases which have failed to give a decided reaction will not unfrequently develop clinical symptoms if put to hard work immediately after being tested.

Reaction, both thermal and local, but especially the latter, is not as well marked in mules as in horses, but as in the former acute symptoms are more likely to develop early in the course of the disease, the risk from latent cases is less serious.

It may be laid down as a general rule that while an apparent improvement in health and condition may, and frequently does, follow the application of the test in mild or incipient cases, the effects of Mallein on animals in advanced stages of the disease are invariably bad, and that the testing of such cases hastens a fatal termination.

Local reactions are more pronounced in hot weather than when the atmospheric conditions are moderate. In connection with this statement

would call attention to the fact that under temperate weather conditions, as, for instance, on the Pacific slope, the prevailing type of Glanders, while decidedly infectious, is much milder than that seen in most other parts of the country.

Sudden changes of weather seem to favour the development of acute cases, while under steady heat or cold the disease frequently remains dormant. For this reason serious outbreaks are with us more common in spring and fall than in the steady weather of winter and summer.

I am aware that my conclusions as to what constitutes a typical reaction to Mallein differ somewhat from those arrived at by the Eighth International Veterinary Congress held at Budapest last year. I have, however, been guided entirely by the results of our own work, and as these are most convincing, I am inclined to attribute the variation, which is, after all, more apparent than real, to a possible difference in conditions between Europe and America.

I need hardly point out that, in order to secure satisfactory results, the conditions surrounding the animals should be normal while the test is being conducted. The administration of water, and even of food, the regulation of body heat and of ventilation, must all be carefully watched, in view of their relation to thermal change. For the same reason no exercise whatever should be permitted while the test is being carried on.

In conclusion I would say that the operations which we have conducted, and their results, have shown in the most convincing manner the great value of Mallein as a diagnostic agent when intelligently used by careful and experienced veterinarians. The expressed views of our inspectors on this point indicate that it can be absolutely relied upon in about 98 per cent. of the animals submitted to its action.

I take this opportunity of expressing my sense of obligation to those inspectors whose comprehensive reports have rendered it possible for me to thus summarize the results of our work.

I would add that on the occasion of the last annual meeting of the American Veterinary Medical Association, which was held in New Haven, Connecticut, in August of this year, I laid before that body the facts set forth in this report, with the result that the following resolution was unanimously passed by the Association:

"Whereas, in the presentation of Canadian state control work with Glanders by Veterinary Director-General Dr. J. G. Rutherford, it is apparent that the Canadian Government has undertaken control work with infectious diseases of animals upon a scale that is highly creditable and in a way commensurate with the importance of the work, and

"Whereas, actual results shown in this report plainly justify the heavy expenditures incurred; therefore be it

"Resolved, That we commend those in higher Canadian Government authority for thus generously supporting this work, and commend the general

organization and plan of the Canadian work to the consideration of the Federal authorities and to our various state authorities in so far as it may be applicable to their conditions and not already in force."

This hearty endorsement of our policy by the leading veterinarians of this continent is very gratifying, especially when considered along with the movement now on foot in Great Britain to bring about the adoption of measures similar to those in force here.

I have the honor to be,

Sir,

Your obedient servant,

J. G. RUTHERFORD,

Veterinary Director-General and
Live Stock Commissioner.

The Honourable,
The Minister of Agriculture.

