

As gastro-intestinal disinfectants none are superior to, or even comparable with, iodine, phenol, charcoal, hypo-sulphite of soda, sulpho-carbolate of soda, and camphor.

As an anti-convulsive in septic intoxication, chloral surpasses all other drugs, and in addition to its calmative effects on the nervous system, it exercises a most important influence on the colouring matter of the blood. It may be beneficially combined with potassic bromide.

Prior to 1872 (see *Veterinarian*, September 1872) I was in the habit of administering chloral hydrate chiefly as an anti-convulsive and anti-spasmodic, but owing to the perusal of an article on the effects of chloral hydrate on the blood by Thos. Shearman Ralph, M.R.C.V.S., Eng., (*Veterinarian*, February 1872) I was led to make some experiments in this direction, and as the outcome of these I discovered that by administering such drugs as prussic acid, and along with them, or immediately after, chloral hydrate, I could obtain various forms of crystals in the blood of the living animal; and not only so, but that the chemical effect on the blood was so remarkable that in the skin of white dogs a series of chameleon-like changes in the hue of that structure ensued; and further, I proved that chloral hydrate is the most reliable (chemical) antidote to prussic acid. Consequent on the results of these experiments, I began to administer chloral hydrate in blood diseases, such as septicæmia, and more recently in affections due, in my opinion, to the absorption of ptomaines, *e.g.*, azoturia, the congestive forms of milk-fever, and so-called stomach staggers.

In concluding this paper I desire to impress upon all the imperative necessity which exists for the adoption of strictly antiseptic precautions, and for observing absolute cleanliness in the performance of all operations; and still further, for protecting all bruised skin and exposed surfaces from the atmosphere and from contact with putrefying fluids, or gases of putrefaction; particularly so in cases in which there is reason to fear that the constitutional condition of the patient is unsatisfactory.

EXPERIMENTS WITH MALLEIN.¹

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(Translated by Professor A. E. Mettam, M.R.C.V.S.)

MALLEIN is a glycerine extract of the bacillus of glanders; it was prepared for the first time by the Russian Military Veterinarian Kalning, of Dorpat.

The first experiments made in Russia and in Germany showed at once that mallein could be used for the diagnosis of glanders. Its action upon animals affected with glanders is identical with that of tuberculin on tubercular subjects; it brings about a marked elevation of temperature. In France, the very important experiments of M. Nocard confirmed the specific action of mallein, and at the same time specified the methods to be adopted in its use. Since the publication of these details, all animals glandered or suspicious,

¹ Translated from the *Revue Vétérinaire*, September 1892.

brought to the cliniques of the Toulouse School have been subjected to the searching injections of the mallein of Roux, and the results of these trials are summarised below.

Observations I. and II.—On the 4th May 1892, the department of sanitary police received two horses obtained from the province of Aude, and considered suspected of glanders.

One of the two was a gelding, of the Percheron breed, six years old. He showed an abundant bilateral discharge, of bad character, and on the right side a gland the lobules of which, otherwise perfectly distinct, were hard and enlarged. Upon the pituitary mucous membrane, which was of a brilliant red, several very small and isolated ulcers were found. The animal was clinically glandered.

The second subject was a gelding, Breton breed, thirteen years old. There was no discharge, and the pituitary mucous membrane did not show any lesions in the regions that could be explored. The sublingual glands were surrounded by a slight infiltration; they appeared to be a little enlarged; on the right side the gland was hardened towards the posterior part. This horse cohabited with the former, and was therefore markedly suspicious, but there did not exist any symptom which would allow of his being condemned forthwith.

The two horses were submitted to mallein at the same time as a sound ass intended to serve as a control.

At the same time, however, we had recourse to other methods of diagnosis. We obtained, after exercise, a small quantity of the discharge, with which we inoculated a dog by means of scarifications in the region of the forehead. Further, the gland on the right side

<i>Number of Hours after Inoculation.</i>	<i>1. Glandered Horse. Initial Temperature = 38°.</i>	<i>2. Suspected Horse. Initial Temperature = 38·7°.</i>	<i>Control Ass. Initial Temperature = 37·3°.</i>
8	40·2	40·4	37·2
9	40·6	40·8	38·1
10	40·9	41·0	37·7
11	40·9	41·0	37·7
12	40·6	40·9	37·4
13	40·6	41·1	37·3
14	40·6	41·2	37·6
15	40·2	41·0	37·5
16	39·9	41·0	37·7
18	39·8	40·8	37·4
20	39·5	40·5	37·4
22	39·4	40·4	37·3
24	39·0	40·3	37·4

was extirpated, and the juice obtained by scraping sections was inoculated into the peritoneum of a male guinea-pig. (These two attempts gave negative results.)

On the 4th and 5th of May the temperatures of the three were taken every four hours; they ranged between 37.9° and 38.6° for the glandered horse, between 38° and 38.7° for the suspected animal, and for the control ass 37.3° and 37.7° .

On the 5th of May, at 9 o'clock in the evening, the three subjects were inoculated under the skin of the neck, the horses receiving 25 centigrammes of mallein and the ass 20 centigrammes.

The foregoing table shows the temperatures at the time of inoculation and during the following 24 hours.

The elevation of temperature was thus 2.9° for the glandered animal, and 2.5° for the suspected horse; it remained sensibly the same in the ass, which had received a dose of mallein proportionately greater.

In the two horses we found at the seat of inoculation a smooth tumour about 20 centimetres in diameter, œdematous, hot and very painful; in the ass the swelling reached scarcely the size of a nut, and it was quite painless.

The horse I. (glandered) was killed on the 7th of May; we found ulcerated patches on the pituitary mucous membrane and very numerous buttons on the turbinated bones. The lungs were permeated with hæmorrhagic infarctions and grey tubercles of quite recent formation.

Moreover, notably in the anterior lobes, several centres of more remote date.

Horse II. (suspected) was killed on May 10th. The nasal cavities were absolutely free from disease. The mucous membrane of the trachea showed, towards the middle region of the neck, a very old radiated cicatrix. In the lung tubercles in all stages of development were found; the pleura was thickened in many places and covered with new membranes.

It is at least probable that this second horse, with scarcely a clinical sign, infected the first.

Observation III.—Mare of Gersian breed, aged ten years, sent on July 18th. The symptoms were as follows: abundant bilateral discharge, purulent, greenish-white in colour, adhering to the nostrils; lymphatic glands of the intermaxillary space infiltrated, but mobile and soft; nevertheless, at the posterior extremity of one of them a nodule the size of a nut was present, hard and fixed at its roots. Nothing was seen on the pituitary mucous membrane. The patient was lame on the right posterior member; when resting, no weight was put upon it; exploration showed it to be hot and painful in every part.

The characters of the discharge, the indurated glandular nodule, and the co-existence of a reticular lymphangitis pointed to the presence of glanders. On July 18th the temperature, taken regularly, went up from 39.4° at 11 A.M. to 40.3° at 5 P.M. The development of the lymphangitis sufficiently explains the increase of temperature. Next day, on the 19th, support is put upon the limb, examination no longer gives rise to pain. The temperature is down to 38.2° at 6 o'clock in the morning; it varies, during the day, between 38.6° and 37.5° .

Inoculation was made at 9 o'clock in the evening, in the neck, with 2·5 cubic centimetres of mallein diluted 1 to 8.

INITIAL TEMPERATURE = 37·5°.

<i>After.</i>	<i>Temperature.</i>	<i>After.</i>	<i>Temperature.</i>
8 hours.	38·4	16 hours.	40·4
9 "	38·4	17 "	41·0
10 "	38·5	18 "	41·4
11 "	39·3	19 "	41·7
12 "	39·5	21 "	41·5
13 "	39·6	23 "	41·4
14 "	39·9	24 "	41·3

The rise in temperature was 4·2°.

About the tenth hour after inoculation the patient was very sick. The animal stood at the end of the halter with the head down, and appeared completely upset. Appetite had gone, but she sought for cold water. At the seat of inoculation an œdematous tumour, flattened, irregularly rounded, and about 20 centimetres in diameter appeared. The mare was killed on July 26th. We found merely a few ulcers on the nasal septum. The sinuses were filled with pus; the mucous membrane was covered with buttons several of which were ulcerated. In the lung, numerous young tubercles and ecchymosis; on the inferior part of the right lobe, in a very limited infiltrated area, an accumulation of a hundred tubercles, caseous, yellow, and of the size of a lentil.

Observation IV.—A Tarbaise mare, 10 years old, received on July 20th. The animal showed the classical symptoms of nasal glanders. It showed, moreover, traces of multiple peri-articular enlargements which had been treated by revulsives.

INITIAL TEMPERATURE = 38·2°.

<i>After.</i>	<i>Temperature.</i>	<i>After.</i>	<i>Temperature.</i>
6 hours.	40·4	13 hours.	40·2
7 "	41·0	14 "	40·
8 "	40·9	16 "	40·
9 "	41·0	18 "	39·9
10 "	40·5	20 "	39·9
11 "	40·4	22 "	39·8
12 "	40·5	36 "	39·5

The temperature ranged during the day between 38° and $38\frac{3}{4}^{\circ}$. Inoculation was practised at 11 P.M. with $2\frac{1}{2}$ cubic centimetres of mallein diluted 1 to 8. The temperature rose $2\cdot8^{\circ}$. At the inoculation point a hot and painful swelling appeared 15 centimetres in diameter.

The animal was killed on the 24th July. The nasal septum was covered with deep ulcerations. The larynx was also the seat of extensive lesions, and the tip of the epiglottis was completely destroyed.

In the trachea buttons and ulcers more or less confluent were met with upon the whole of the extent of its mucous membrane. In the lung, a lobar pneumonia involving the larger portion of the right lung was found: in the same part were patches of a sub-acute pleurisy. Many tubercles were scattered throughout both lobes; young grey tubercles were most numerous.

Observation V.—A Tarbaise mare, 15 years old, came on the 25th July. The animal did not present any symptom of glanders; it was suspected solely because it had cohabited with the previous subject. In spite of prolonged exercise we obtained only a few drops of a clear discharge, which, when inoculated into a dog, did not set up any lesion. On the 25th the temperature oscillated between $38\cdot5^{\circ}$ and $39\cdot0^{\circ}$. Inoculation was made the same day, at 9 P.M. with $2\frac{1}{2}$ cubic centimetres of a 1 to 8 dilution of mallein.¹

INITIAL TEMPERATURE = 39° .

<i>After.</i>	<i>Temperature.</i>	<i>After.</i>	<i>Temperature.</i>
8 hours.	40·9	}	16 hours.
10 "	41·0		
12 "	41·6		
15 "	41·2	20 "	40·7
		22 "	40·6

The reaction was $2\cdot6^{\circ}$. The seat of inoculation showed a huge tumour. Ten hours after the injection, the mare, although in very good condition, was very sick; she refused all food.

The owner consented to her destruction, and the autopsy was made on the 28th in the presence of MM. Duffant, Inspector of the Abattoir of Toulouse, and Lignon, Sanitary Veterinarian. The nasal septum was perfectly sound; in the cavities there was only found a very old scar towards the superior part of the lower right turbinated bone. Nothing in larynx and trachea. The lung, however, was full of tubercle-like masses, the size of a hazel-nut to that of a walnut; further, we found numerous agglomerations of grey tubercles, attaining the size of a pea.

Here indeed, it is probable that this animal, kept for a long time in a stable without ever being suspected, had contaminated the mare that was the subject of the preceding experiment.

Observation VI.—Limousin mare, 8 years old, entered on the 2nd of August.

¹ The mare being very difficult to handle, the number of times the temperature was taken was reduced as much as possible.

INITIAL TEMPERATURE = 39.2°.

<i>After.</i>	<i>Temperature.</i>	<i>After.</i>	<i>Temperature.</i>
9 hours.	40.3	20 hours.	41.0
10 "	40.3	22 "	40.5
11 "	40.5	33 "	39.8
12 "	40.8	38 "	39.3
13 "	40.7	42 "	40.2
14 "	40.8	45 "	39.7
16 "	40.9	48 "	39.2
18 "	41.1		

The patient presented the well-known signs of nasal glanders : discharge, abundant and bilateral ; glands much increased in size, united together, hard and deeply fixed.

On the 2nd of August, the temperature varied between 38.6° and 38.9°, attaining in the evening 39.2°. At 9 P.M. we injected in front of the shoulder, into the muscular tissue, 2½ cubic centimetres of 1 to 8 dilution of mallein. The temperature only got up 1.9°.

At the seat of inoculation was a hard tumour, not of great size, but very painful. Without doubt the small amount of local reaction is to be attributed to the fact that the injection was made into the muscle : perhaps, also the general reaction is less for the same reason. The subject was slaughtered on the 6th of August. The nasal septum was covered with patches of deep ulcerations. In the lung we met with a great number of tubercles, the majority grey with a yellowish-white centre, scattered almost uniformly in the two lobes.

Besides the before-mentioned experiments, six horses and an ass have been inoculated and have not shown any reaction.

Four of these were suspected, either because of symptoms shown, or because of contact with glandered animals, and not having been killed, these observations have only a relative value, based upon the negative results of other experimental methods of diagnosis (inoculation of the discharge into the dog and guinea-pig, cultivation and examinations for the bacillus). One of these animals had a collection of pus in the sinuses which was known to be non-specific.

Two other horses and an ass have been destroyed, and in these no lesion of glanders was seen.

These results confirm those which have been obtained by M. Nocard : mallein yields us a marvellous method for the diagnosis of glanders, and it may reveal the disease when all other experimental procedures are either inapplicable or insufficient. (*Observation II.*)

An elevation of temperature of 2° and upwards will permit us to affirm that the animal is glandered ; moreover, the reaction betrays itself by evident clinical signs ; although sound animals are not affected,

the glandered present, ten or twelve hours after inoculation, signs of extreme dulness; the appetite has disappeared, the patient stands with back arched, head lowered, and muscular tremblings or rigors are observed from time to time. This condition is so marked that the least intelligent of persons may easily diagnose it from afar. The local signs are also very significant: although the sound horse presents next day, at the point of inoculation, only a slight swelling the size of a hazel-nut, with little or no pain, the glandered brute shows a hot, spreading and extremely painful œdema. When these symptoms are manifest we are justified in considering the animal as glandered, even when the increase of temperature is between $1\cdot5^{\circ}$ and $2\cdot0^{\circ}$, and more especially if the initial temperature attains or exceeds $39\cdot0^{\circ}$.

Is this reaction absolutely unequivocal? This is a point which ulterior observations will decide. Still, it is important to note that the intensity of the reaction is not—any more than in tuberculosis—directly proportional to the extent of the lesions. We are only justified in concluding that glands is not present after the minute examination and dissection of every organ. Tuberculin sets up the characteristic reaction when the lesions are extremely minute, situated far away in the lymphatic glands, or in the marrow of bone: the analogies between the two products are so close that we may suspect mallein to have similar properties.

A second question, quite relative, also naturally crops up—is this reaction constant? Is it obtainable in all conditions and in every subject? Upon this point, also, experience must decide. But, whatever occurs, the diagnosis of glanders by mallein should none the less mean a considerable advance and a powerful weapon for sanitary intervention.

It may be of interest to see if there is produced in glandered animals a tolerance for the soluble products analogous to that which is so manifest in tubercular subjects.

Experiment I.—Horse II., which had presented a maximum temperature of $41\cdot2^{\circ}$ fourteen hours after injection, was submitted two days later to a new test with the same dose of mallein. With the view of recording the course of the temperature curve during the first hours, the injection was made at 5 A.M.

INITIAL TEMPERATURE = $37\cdot8^{\circ}$.

<i>After.</i>	<i>Temperature.</i>	<i>After.</i>	<i>Temperature.</i>
2 hours.	37·8	13 hours.	40·6
3 "	38·1	14 "	40·8
4 "	38·5	15 "	41·0
5 "	38·2	16 "	40·7
6 "	38·6	18 "	40·0
7 "	39·3	24 "	39·1
8 "	39·5	26 "	39·1
10 "	40·5	28 "	39·4
11 "	40·9	36 "	38·9
12 "	40·9	40 "	38·5

The temperature went up to 41° instead of 41.2° ; the reaction was, on the other hand, to 3.2° instead of 2.5° in the previous test. The swelling at the seat of inoculation was much less extensive.

Experiment II.—Subject of Observation IV. in which the temperature went up 2.8° , up to 41° , was submitted to a second inoculation 48 hours after the first.

INITIAL TEMPERATURE = 39.5° .

<i>After.</i>	<i>Temperature.</i>	<i>After.</i>	<i>Temperature.</i>
7 hours.	41.0	14 hours.	39.2
8 "	40.3	16 "	39.4
9 "	40.1	18 "	39.0
10 "	39.8	20 "	39.5
11 "	39.5	22 "	39.9
12 "	39.2	30 "	38.9
13 "	39.8	32 "	38.7

The maximum temperature of 41° was again reached, but the reaction was only 1.5° .

Experiment III.—The mare which was the subject of Observation III. was submitted every day, at 9 P.M., for 6 days to inoculations with the usual dose of mallein. The first inoculation had given a reaction of 4.2° , up to 41.7° . The results of the first test are recorded up to the 24th hour, the time for the next inoculation.

2ND INOCULATION. INITIAL TEMPERATURE = 41.3° .

<i>After.</i>	<i>Temperature.</i>	<i>After.</i>	<i>Temperature.</i>
9 hours.	41.0	16 hours.	40.9
11 "	41.5	17 "	40.8
12 "	41.2	19 "	40.8
13 "	41.0	21 "	40.8
14 "	41.0	24 "	40.6
15 "	41.0		

Sickness less marked at evening. Tumour painful at seat of inoculation.

3RD INOCULATION. INITIAL TEMPERATURE = $40^{\circ}6$.

<i>After.</i>	<i>Temperature.</i>	<i>After.</i>	<i>Temperature.</i>
8 hours.	41·0	15 hours.	40·6
9 "	40·0	16 "	40·4
10 "	40·1	18 "	40·0
11 "	40·6	23 "	39·5
12 "	40·4	24 "	39·0
14 "	40·6		

Swelling at seat of inoculation. General condition better.

4TH INOCULATION. INITIAL TEMPERATURE = $39^{\circ}0$.

<i>After.</i>	<i>Temperature.</i>	<i>After.</i>	<i>Temperature.</i>
8 hours.	40·0	15 hours.	39·3
9 "	40·2	16 "	39·6
10 "	40·0	18 "	39·6
11 "	40·0	20 "	39·2
12 "	39·4	22 "	38·9
13 "	39·0	24 "	39·2
14 "	39·0		

Tumour painful at seat of inoculation.

5TH INOCULATION. INITIAL TEMPERATURE = $39^{\circ}2$.

<i>After.</i>	<i>Temperature.</i>	<i>After.</i>	<i>Temperature.</i>
9 hours.	38·0	18 hours.	39·5
10 "	38·2	19 "	39·0
11 "	38·8	20 "	39·3
12 "	40·1	22 "	39·1
14 "	39·8	24 "	39·6
15 "	39·9		

Appetite is good. Tumour at point of inoculation is circumscribed.

6TH INOCULATION. INITIAL TEMPERATURE = 39°6'.

<i>After.</i>	<i>Temperature.</i>	<i>After.</i>	<i>Temperature.</i>
9 hours.	39°6	19 hours.	39°7
10 "	40°5	20 "	39°7
11 "	40°3	21 "	39°5
12 "	40°2	24 "	39°2
13 "	40°0	36 "	38°8
14 "	40°2	38 "	38°6
16 "	40°0		
17 "	39°8		

From these details we may deduce—

1st. That it is possible to obtain a long series of reactions in glandered animals, tolerance being less rapid in these than in tubercular subjects with regard to tuberculin.

2nd. That the intensity of the secondary reactions, and especially their duration, nearly always regularly decrease.

SOME JOINT DISEASES OF THE HORSE.

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IN the present article I purpose describing certain diseases of the joints of the horse of considerable practical interest.

Joint diseases may be divided into—1. Suppurative; 2. Non-suppurative. It is true that in places these at times overlap, that a non-suppurative in the first instance may later prove of a suppurative character, but though no hard and fast rule can be drawn, yet for practical purposes the division holds good. There is one rule, however, to which I know no exception—what may be described as specific joint diseases, viz., phalangeal and tarsal exostosis, and navicular disease, never under any circumstances take on a suppurative action, though why they do not when the articular ends of the bones are affected is difficult of explanation.

Suppurative Diseases.—Injuries which at the time or shortly afterwards open the joint.

Non-Suppurative Diseases.—Sprains, fractures within the joint, calcareous degeneration of the cartilage, absorption of cartilage, and specific joint diseases.