CIHM
Microfiche
Series
(Monographs)

ICMH
Collection de
microfiches
(monographies)

Canadian Institute for Historical Microreproductions / Institut canadien de microreproductions historiques

Technical and Bibliographic Notes / Notes techniques et bibliographiques

The Institute has attempted to obtain the best original copy available for filming. Features of this copy which may be bibliographically unique, which may alter any of the images in the reproduction, or which may significantly change the usual method of filming are checked below.

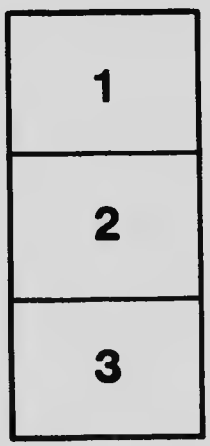
- ☐ Coloured covers / Couverture de couleur
- ☐ Covers damaged / Couverture endommagée
- ☐ Covers restored and/or laminated / Couverture restaurée et/ou pelliculée
- ☐ Cover title missing / Le titre de couverture manque
- ☐ Coloured maps / Cartes géographiques en couleur
- ☐ Coloured ink (i.e. other than blue or black) / Encre de couleur (i.e. autre que bleue ou noire)
- ☐ Coloured plates and/or illustrations / Planches et/ou illustrations en couleur
- ☐ Bound with other material / Relié avec d'autres documents
- ☐ Only edition available / Seule édition disponible
- ☐ Tight binding may cause shadows or distortion along interior margin / La reliure serrée peut causer de l'ombre ou de la distorsion le long de la marge intérieure.
- ☐ Blank leaves added during restorations may appear within the text. Whenever possible, these have been omitted from filming / Il se peut que certaines pages blanches ajoutées lors d'une restauration apparaissent dans le texte, mais, lorsque cela était possible, ces pages n'ont pas été filmées.
- ☐ Additional comments / Commentaires supplémentaires:

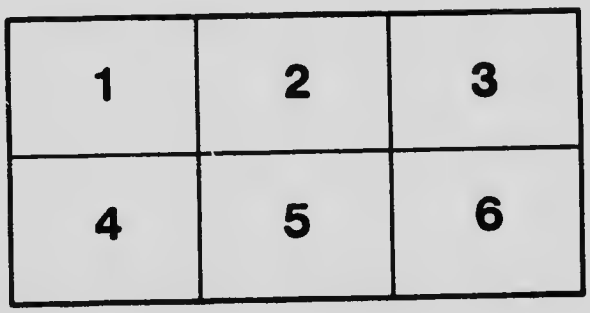
L'Institut a microfilmé le meilleur exemplaire qu'il lui a été possible de se procurer. Les détails de cet exemplaire qui sont peut-être uniques du point de vue bibliographique, qui peuvent modifier une image reproduite, ou qui peuvent exiger une modification dans la méthode normale de filmage sont indiqués ci-dessous.

- ☐ Coloured pages / Pages de couleur
- ☐ Pages damaged / Pages endommagées
- ☐ Pages restored and/or laminated / Pages restaurées et/ou pelliculées
- ☑ Pages discoloured, stained or foxed / Pages décolorées, tachetées ou piquées
- ☐ Pages detached / Pages détachées
- ☑ Showthrough / Transparence
- ☐ Quality of print varies / Qualité inégale de l'impression
- ☐ Includes supplementary material / Comprend du matériel supplémentaire
- ☐ Pages wholly or partially obscured by errata slips, tissues, etc., have been refilmed to ensure the best possible image / Les pages totalement ou partiellement obscurcies par un feuillet d'errata, une pelure, etc., ont été filmées à nouveau de façon à obtenir la meilleure image possible.
- ☐ Opposing pages with varying colouration or discolourations are filmed twice to ensure the best possible image / Les pages s'opposant ayant des colorations variables ou des décolorations sont filmées deux fois afin d'obtenir la meilleure image possible.

This item is filmed at the reduction ratio checked below / Ce document est filmé au taux de réduction indiqué ci-dessous.

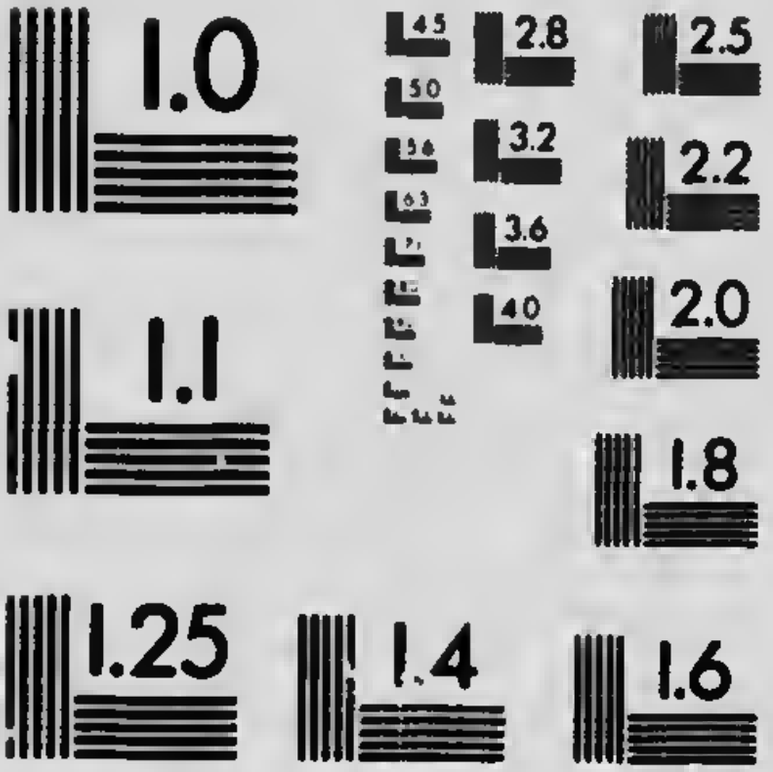
10x	12x	14x	16x	18x	20x	22x	24x	26x	28x	30x	32x
								✓			





MICROCOPY RESOLUTION TEST CHART

(ANSI and ISO TEST CHART No 2)



APPLIED IMAGE Inc

1653 East Main Street
Rochester, New York 14609 USA
(716) 482 - 0300 - Phone
(716) 288 - 5989 - Fax

STUDIES FROM THE ROYAL VICTORIA HOSPITAL
MONTREAL. VOL. 2, No. I. (GLANDERS)

A STUDY OF CHRONIC GLANDERS IN MAN

WITH REPORT OF A CASE

ANALYSIS OF 156 CASES COLLECTED FROM THE LITERATURE

AND AN

APPENDIX OF THE INCIDENCE OF EQUINE AND HUMAN GLANDERS IN CANADA

BY

GEORGE DOUGALL ROBINS, M.D.

CLINICAL ASSISTANT IN NEUROLOGY
TO THE ROYAL VICTORIA HOSPITAL

MAY 1906

INTRODUCTION.

THE following study of chronic glanders is suggested by the occurrence of a case which the writer had the opportunity of observing for many months, in 1900-1902, when he was engaged in country practice. Later the case came under the care of Dr. James Bell in the surgical wards of the Royal Victoria Hospital for several months on two occasions, and it is with Dr. Bell's kind permission that it is published here in full.

Glanders in man is not common, and the chronic form may be described as relatively rare. So far as we have been able to discover, this is the first case of the latter condition of the disease hitherto published in Canada, though probably not the first to occur.

Since this case came under my observation I have again become connected with the Royal Victoria Hospital, and though my usual work in the Pathological Department is of a special character, still, through the kindness of Professor Adami, full access to the autopsy material has been afforded to me. Then again, access to the Medical Library at McGill University has afforded me the opportunity for studying thoroughly the literature on the subject and has made it possible for me to bring together and compare other like cases recorded in the literature, and it is this opportunity that has led to the production of the present work.

I freely admit that to compile a monograph upon a single case is in general most reprehensible and it would have been absurd to make this single case of ours a subject of dissertation upon glanders in general, but as already stated glanders in man is a rare condition, sufficiently rare, that is, to make it unlikely that any individual Anglo-Saxon observer should encounter more than a solitary case, while a search for the cases so far recorded has brought to our notice no full study of this particular form of the disease—certainly not in the English language. Hence it seemed to be serviceable to bring together and analyse all the cases found recorded; the time, indeed, appeared to be opportune for a monograph on the subject of chronic glanders.

Nevertheless, we publish this after some deliberation. At the outset one has to recognize that the distinction between acute and chronic glanders, as between acute and chronic forms of any infectious disease, is a matter of convenience.

between cases of the duration of a few days and those lasting many years, there is no distinct gap, nor is great help to be found fro a study of the symptoms met with in the more or less fatal cases respectively. Certain broad lines of difference may, it is true, be drawn, and undoubtedly for prognostic and other purposes to make the division is of distinct use. Thus for the purposes of this paper we have decided to consider all cases chronic which had a duration of six weeks or more. After having come to this decision it is satisfactory to find that Bollinger has proposed a like division in distinguishing the acute from the chronic; he has made the further division, which does not immediately concern us, into acute proper, lasting four weeks, and subacute, running a course of between four and six weeks.

It is very difficult to discuss chronic glanders at all fully without from time to time referring to the disease in general, and, although we have conscientiously endeavored to restrict our treatment of the subject, we have found it impossible to draw a clear picture without including matter which equally bears upon the condition of acute glanders. For this we must ask the indulgence of the reader to whom, through the greater frequency of the acute form, these matters are familiar.

A further note regarding the nomenclature may here be added, viz. the division of the disease into Glanders and Farcy is one more justified by convenience of description than by any sharp clinical distinction in concrete cases. As Bollinger says, "the distinction between glanders and farcy, recognized by most authors, is not founded upon any scientific mode of classification." Cases of pure glanders, i. e. of ulceration pure and simple of the mucous membranes, and of pure farcy, i.e. of abscesses affording a thin, glairy pus ("Farcy oil"), studded subcutaneously along the course of the lymphatics, are rarely encountered; the majority of cases are mixed, affording the characteristics of both glanders and farcy. And now that it has been so fully demonstrated that these are but manifestations of the one disease, to retain separate names of varieties of the one affection cannot be entertained.

The present case, with some remarks on its more interesting features, will first be presented and this will be followed by a brief synoptical record of chronic cases collected from the literature. The way will then be open for a consideration of the whole subject of chronic human glanders, based largely upon these cases, and with frequent statistical statements based upon an analysis of them. A reference will be made to latent human glanders, and the analogy of glanders to other diseases of the infective granulomatous type will be taken up very

shortly. A brief statement of some conclusions, which I have thought it legitimate to draw from a study of these cases, will close this part of the subject. The appendix will contain a statement as to equine glanders in Canada and its regional distribution, almost exclusively based on information furnished me through the great kindness of Dr. J. G. Rutherford, Veterinary Inspector General for Canada. After a short note on glanders in man in this country, some account of the comparatively few Canadian cases of glanders of which the writer has been able to get any record, some of which are here published for the first time, will bring the paper to a close.

OUR OWN CASE OF CHRONIC GLANDERS.

L. P. C., farmer, aged 46, born in the Province of Quebec, was always a very hard worker, often laboring 16 hours of the 24. His habits were good and his health robust; he never used alcohol in any form and never had venereal disease.

In 1897 he had an attack of what was called rheumatism, affecting chiefly the upper and outer part of the left thigh. This confined him to bed for several days, though there was very little fever. Recovery was perfect. In the Spring of 1900 pain and tenderness developed over the right olecranon. This was not severe enough to keep him from work, but there was for a time moderate local redness and swelling, which however subsided long before the tenderness and pain, which latter persisted three months.

On the 24th of November, 1900, after a few days malaise, the patient had an attack characterized by anorexia, chilliness, fever (T. 102⅘°, P. 90), slight headache, backache, pains all over the body, and constipation. When first seen on Nov. 25, in addition to these symptoms there were two rather large, acne like papules in the skin on the forehead, slightly to the right of the median line and about an inch above the frontal eminence. One was vertically above the other, and the lower was the larger. These had been noticed by the patient a very few days before and were tender and painful out of proportion to what one would expect from their appearance. He was not aware that they followed an abrasion or an injury to the head. Two days later a whitish œdema surrounded the papules for some little distance and they were becoming pustular, but the temperature had fallen considerably and soon became normal. This œdema lasted only two or three days. The appetite improved and except for weakness the patient felt well. The pustules had broken, discharging a little thin, yellowish, inoffensive pus and leaving undermined ulcers with little tendency to heal.

After being out of doors on the first of December, he had marked pain and tenderness in the left mid thigh posteriorly, over the sciatic nerve, and slight pain and tenderness below the outer half of Poupart's left ligament. On the 3rd of December fly blisters were applied to these regions. This greatly eased the pain posteriorly, but an abrasion of the skin followed, which gave rise to a superficial sore which, though antiseptically treated, only healed about the 20th of December. A day or two after its healing a firm, deep-seated, almost painless swelling formed beneath the site of the abrasion. This soon attained the size of a small hen's egg, but later almost disappeared, only to increase again in size the following month (January 1901). In spite of blistering, the pain and tenderness felt over an area the size of one's palm just below the outer half of Poupart's left ligament increased till it became almost unbearable, though no objective abnormality was noticeable. No ease was obtained till the 21st of

December, when the spontaneous pain ceased. The tenderness, however, continued and a day or two later a whitish œdematous swelling appeared over the tender area. Aspiration of this on the 31st of December gave an inoffensive, thick, ropy, mucoid pus, pink in color when withdrawn, but turning to a pale café-au-lait on standing. Stained coverslip preparations failed to show the presence of bacteria in the pus.

During the development of these lesions, i.e. during December, flatulence after food was troublesome, but there was no fever till the abscess began to point, with the exception of two or three sharp evening rises, one of which reached 103°.

Questioning showed that between three and four years previously one of the patient's horses had acquired a nasty-looking, though inoffensive, muco-purulent discharge from the nose, accompanied by dry cough and enlargement of the glands under the jaw. These symptoms had persisted till the current date. His other horses had one after another contracted this ailment, and horses purchased more recently had become infected in their turn. Their general condition had, however, remained good, and they had worked well, probably because they were unusually well fed. I suspected that the horses might be suffering from glanders and that the human disease was probably of the same nature. Thus it was advised to have the horses tested with mallein. After some delay, caused by the refusal of the veterinary surgeon summoned to admit the possibility of such a diagnosis, the test was made by Dr. A. E. Moore, Government Inspector of Stock. Four of them—all the patient's horses but two that had been comparatively recently acquired—reacted typically and were shot the following day, the 24th of January.

On the 3rd of January, 1901, the lower part of the upper swelling on the thigh was incised and between two and three ounces of light chocolate-colored pus obtained. A drainage tube was inserted and the cavity was syringed daily with antiseptics. At about the same time (Jan. 3rd) a firm, tender swelling appeared in the anterior tibial muscles of the left leg, about two-thirds of the distance from the knee to the ankle. A few days later a small nodule the size of a peanut was felt below the crest of the left ilium posteriorly, over the gluteal muscles. This latter disappeared in a fortnight and caused no subsequent trouble.

As the evening temperature was ranging between 99½° and 101½° and the anterior tibial swelling had become as large as a good-sized hen's egg, it was incised on the 10th of January. No pus was obtained—only a little deep-red, viscid, oily fluid, on cutting deeply into the muscles, but the discharge became purulent in a few days. On the 19th of January the swelling at the back of the left thigh, which, after greatly diminishing, had become slightly larger than ever, was also cut into, and a deep seated area of softening was found similar to that in the anterior tibial muscles. Here too the discharge soon became purulent.

All the wounds discharged freely. The pus was never offensive and, though it varied considerably in consistence and color, was usually moderately thin and of a dirty chocolate color.

A few days after the anterior tibial incision was made, the edges of the cut, where it had gone through sound flesh, became slightly nodular, of a livid red color and had a gristly feel. A similar infection of wounds and a cartilaginous induration, sometimes extending for some little distance around the wound, were noticeable on subsequent occasions when the incisions had to be enlarged.

There was a marked tendency for sinuses to burrow deeply even when there was the freest possible drainage. By the 28th of January there were sinuses burrowing for a distance of from one to three inches from the openings and discharging pus profusely. The evening temperature was also running higher (102⅘°). Pain and swelling had extended from the anterior tibial wound to the left ankle, movement of which was painful. Early in February these sinuses were slit up and swabbed with liquefied carbolic acid. After this the temperature fell, the discharge was less and the patient's general condition improved. He began to regain the flesh lost during December and January, his appetite was excellent, there was no flatulence and he slept unusually well.

The nodules on the forehead, which had kept on discharging, without any change in their appearance until the 15th of February, then became more swollen and two other nodules formed below them, so that the infection reached as low as the frontal eminence. Under incision and repeated swabbing with liquefied carbolic acid this activity slowly subsided. The old nodules healed about the 15th of April, but the lowest was still open on the 28th of May. These lesions at one stage presented crater like ulcers, with red, swollen, angry-looking, undermined edges. In juxtaposition they gave an appearance which might perhaps be best described as resembling the raised, inflamed track of a worm crawling beneath the skin, the ulcers marking the points at which it entered its burrow.

Cultures made from the wounds in February for the McGill Veterinary College Pathological Department were unsatisfactory. The bacillus mallei was not demonstrated. Of two guineapigs injected one was unaffected and the other developed septicæmia.

On the 16th of March an enlarged gland, the size of a Lima bean, which had been felt for two weeks beneath the right angle of the lower jaw, and which was threatening to break down, was excised. On section the centre of this gland was composed of a thick, glairy fluid showing leucocytes and debris on microscopical examination, but no bacteria. A few days after this gland was excised another appeared close to the wound, but disappeared in about ten days without causing any trouble.

An interesting but discouraging feature of the case was the frequency with which the wounds, after slowly improving for some time, would rapidly retrograde in some one part. A greyish slough would perhaps be visible for one or two days, after which a broken-down area, one half to one inch in extent would remain. Usually such holes filled up very slowly, perhaps showing no improvement in six weeks.

In spite of these local draw backs, the patient's general condition continued to improve. He ate well, slept well, felt well, and sat up

daily, getting about on crutches out of doors when the weather became fine. By the 18th of April his weight had increased to 156 lbs., only four pounds less than his normal weight. Slight irregularity of the heart's action was occasionally, though rarely, noticeable.

One-sixth of a cubic centimeter of mallein was injected into the front of the left thigh at 7 p.m. on the 28th of April, the temperature being 99⅘° at the time. There was absolutely no local effect and the highest temperature during the next 36 hours was 99⅕°.

On the 4th of May and again on the 7th and 9th, after considerable exposure to cold, chilly sensations and fever (101⅗° to 102⅘°) developed during the forenoon. There were pains in the top of the head, temples, eyeballs and cheek-bones, and bringing the teeth sharply together caused a little pain. Cardiac irregularity became more marked, the appetite failed and flatulence became more troublesome. The headache, dull and throbbing in character, increased to such an extent that sleep was seriously interfered with and an apathetic inertia developed, in marked contrast to the patient's former cheerful bearing. There was sweating at night occasionally and the temperature range was higher. The urine, loaded with urates, showed a partial reduction of Fehling's solution, evident only after the specimen stood for some time after boiling, or if the boiling was prolonged.

A careful physical examination made on the 16th of May revealed no new fact of importance. The headaches increased till even hypodermics of morphine gave only partial relief. The ocular fundi showed no change, except perhaps slight engorgement of the veins. On two or three occasions there was vomiting without much nausea but accompanied by flatulence. On the 25th of May the headache was terribly severe and there was slight delirium. On the 26th he had slept better and the headache was less and this improvement continued the day following. Some intracranial lesion that might call for operative interference was feared, and in spite of the improvement of the patient's condition, it was thought best to place him under surgical care. He was accordingly admitted to the Royal Victoria Hospital on the 28th of May, 1901, under the care of Dr. James Bell, to whom I owe the following notes.

The patient was then described as a fairly well nourished man with flushed cheeks and flabby muscles. The obvious lesions were, three linear scars, each about two inches long, on the left lower limb; one about four inches above the external malleolus, another on the external surface of the thigh about three inches above the popliteal space, and a third over the great trochanter. Each of these had small sinuses accompanying it, which discharged a thin, yellowish sero-pus. There was also a small sinus over the frontal bone just above the glabella, discharging a similar sero-pus. He complained a great deal of headache, generalized, but had no local pain elsewhere. His temperature ran up from day to day to 100° F. There was no evidence of anything abnormal elsewhere, but he had .8 of 1% of sugar in the urine. The sinuses were curetted.

The Glanders Bacillus was demonstrated by Dr. Archibald and later by Dr. Keenan in the discharge from the above-mentioned sinuses by culture and by inoculation of guineapigs, the practically

pathognomonic testicular swelling being obtained. The same results were obtained repeatedly in the subsequent history of the case, whenever a new lesion was dealt with.

The exclusion of sugar and starch from his diet caused the disappearance of the sugar from his urine in a few days and, although after a short time ordinary diet was allowed, the urine remained free from sugar, with the exception of short periods of recurrence from time to time.

On the 20th of June a small soft nodule was discovered on the occiput. It was painless and about the size of a pigeon's egg. By the 20th of July this had developed to the size of a hen's egg, but was still neither painful nor tender. A small, soft, tender spot had appeared on the outer side of the right leg and both these lesions were incised and curetted.

The patient was discharged on the 21st of September, 1901, with all the old sinuses healed, but with still some discharge from the occipital abscess and the one over the fibula. He was then comparatively free from headache and weighed 147 lbs. His appetite was excellent and he could get about fairly well on crutches, which were necessitated by contracture of the old lesion in the left hamstring muscles.

Contrary to advice he moved about a great deal and even did some light work. Two weeks after leaving the Hospital the urine was of normal amount and did not reduce Fehling's, but the nearly healed occipital wound began to break down, and soon pressure on a spot in front and to the right of the occiput caused thin pus and broken down tissue to exude from the cranial opening. Headache became more troublesome and the afternoon temperature had a slightly higher range. A focus outside the left tibia, at about its middle, required opening on the 9th of October. The old foci in the left leg alternately improved and broke down. On the whole those opposite the tibia were most incorrigible. The cranial wound became deeper and burrowed beneath the skull. The discharge from it consisted principally of curdy, sloughy, yellowish material, not readily removed from the wound, with some admixture of thin, turbid fluid. On the 21st of October and on the 4th of November several pieces of dead bone that had been recognized as necrosed for some days previously, the largest measuring 15 x 5 x 5mm., were removed from the cranial opening. Dressings of this focus were painless. Cerebral pulsation was seen at times at the bottom of the cranial wound, but the lesion appeared to be entirely extradural.

Headache, chiefly frontal, was almost constantly present, pain and heaviness in the eyes were of frequent occurrence, and pain and tenderness in the jaws on closing the teeth were occasional symptoms. At first the headache seemed to diminish when it was possible to clear away very thoroughly all sloughy material from the cranial lesion, but after December 1901 such temporary improvement did not occur. The afternoon temperature, which was generally the highest, ranged from normal to 2° higher.

Although the damage to the skull and the burrowing beneath it kept extending locally, the patient persisted in getting up at 4.30 a.m. to do chores, and was usually out in the woods half the day, super-

intending the getting out of cord-wood and making a road for the teams through the woods.

In January 1902 one of the posterior cervical glands on the left side became enlarged. Later (February) it broke down and a few glands near it were also slightly enlarged.

On the 20th of February, 1902, the patient's condition was thus described. His color was good, but nutrition was rather poor. His complaints were chiefly of frontal headache and pain through the eyes, worse at night, when he slept but poorly, though drowsy by day. Below and behind the left mastoid was a softened swelling 1½ inches in its greatest diameter, due to a breaking-down gland. The daily amount of urine had frequently exceeded 60 ounces, its specific gravity was 1025 and Fehling's was readily reduced. The sinuses in the left leg were practically healed. The temperature was mildly hectic. Just in front of the external occipital protuberance was an opening through the skull, beneath which extended sinuses partly filled with sloughy material and burrowing in various directions. The longest of the tracks extended about 1½ inches beneath the skull. Foci of necrotic bone could be felt on passing a probe forward for an inch beneath the skull. The dura seemed intact. In front and to the left of the cranial wound was a boggy swelling of the scalp, 3 inches in diameter, pressure on which caused a little thin turbid pus to exude into the wound. A similar smaller swelling of the scalp was present behind and to the left of this opening, but no fluid exuded on pressure. These swellings were not accompanied by redness or heat of the parts.

In view of the extension of the intracranial mischief and the increasing constitutional disturbance, he was sent back to Montreal on February 21st, 1902. Dr. Bell has furnished me with the following account of his final stay in the Hospital.

He was readmitted on the 24th of February, 1902, with a discharging sinus over the occiput and another over the left fibula and a recent lesion in the form of a swollen lymphatic gland on the back of the neck, which latter lesion had been developing about five weeks. It was about the size of a hen's egg, hard, swollen, and not tender on pressure. The urine was quite normal. Headache was the chief complaint.

On the 27th of February the opening in the occipital region of the skull was enlarged with rongeur forceps and a quantity of cauliflower-like granulomatous tissue curetted away. This tissue had the appearance and consistence of brain substance. The suppurating gland in the neck was incised, a smaller gland in the same neighborhood removed en masse and the old sinus on the leg curetted. On March 17th the urine again contained sugar. Later a gland in Scarpa's space suppurated and was incised. The patient gradually failed in health and strength, a painless enlargement of the liver developed and he died on the 1st of September 1902, having become comatose a few hours ante mortem.

Autopsy.—I am indebted to Prof. Adami and to Dr. A. G. Nicholls for the report of the autopsy made by the latter, which, as it had to be performed in half an hour, was necessarily incomplete, the thoracic organs not being examined.

The site of operation on the SKULL was marked by an irregular opening through the left side of the calvarium. At this point the inner table of the skull was eroded over an area the size of a cent. The cavity contained soft pus. Between the dura and the bone was a flattened, irregularly oval mass, measuring 8 x 6 cm. and consisting of firm, inspissated pus of a yellowish-white color and rather fibrinous appearance. On peeling it off from the dura, which was readily done, the latter was found to be congested and covered with delicate fibrin. The pia-arachnoid was slightly turbid. The mass pressed upon the left occipital lobe, which was considerably indented. The BRAIN was otherwise normal and weighed 1375 grams.

The STOMACH was small and its mucosa injected. The small gut was normal. The large intestine had its mucous membrane swollen and fiercely reddened from colitis.

The SPLEEN was very large, weighing 620 grams, and rather soft. Its capsule was tense, dark red, and covered in places with adherent fibrinous lymph. Here and there on the surface were a few yellow elevations of dry, fibrino-purulent material the size of a dry pea. On section the organ was intensely reddened and thickly studded with abscesses varying in size from a pin's head to a filbert. The abscesses contained thick, yellowish-white pus and were lined by pyogenic membrane, pointing to a condition of some standing. The spleen was very pulpy and showed numerous gelatinous-looking spots which with iodine gave the amyloid reaction.

The PANCREAS was of normal size, well lobulated, of opaque white color. In the terminal third was a small area the size of a dry pea of a pale green color and with a coarse soft gelatinous appearance, not unlike soft potash soap.

The LIVER was very large, measuring 30 cm. transversely by 27 cm. vertically by 12 cm. from before backward, and weighing 3975 grams. The surface was covered with fibrinous lymph as well as some more plastic material between the capsule and the diaphragm. Between the right lobe and the diaphragm lay an inspissated mass of pus not unlike that on the dura. It was the size of a walnut and indented the liver. There was a similar small mass on the under surface near the edge of the left lobe. On section the liver was of gray color with yellower patches and showed the amyloid reaction. On the left side of the left lobe there was an opaque white, wedge-shaped area. In other parts there was a more diffuse purulent infiltration, apparently following the vessels. This was marked in the left lobe near the upper surface. The glands of the hilus were swollen and reddened. The main branch of the portal vein was free from change.

The KIDNEYS were large, especially the left. The capsule peeled off readily leaving a smooth surface. On section the cortex was swollen, very pale and cloudy and the glomeruli injected. Amyloid disease was not demonstrated and no abscesses were found microscopically in the kidneys. The condition resembled somewhat acute or subacute parenchymatous degeneration.

The SUPRARENALS were enlarged. Microscopic examination showed advanced amyloid change with small collections of leucocytes towards the centre.

Anatomical Diagnosis: — CHRONIC GLANDERS; MULTIPLE ABSCESSES IN GLANDS, MUSCLES, SPLEEN, LUNGS AND LIVER; CHRONIC LOCAL GRANULOMA OF THE DURA MATER; COMPRESSION OF THE BRAIN; AMYLOID DISEASE; ACUTE FIBRINOUS PERIHEPATITIS AND PERISPLENITIS; PORTAL PYLEPHLEBITIS; ACUTE COLITIS; CHRONIC PARENCHYMATOUS WITH EARLY INTERSTITIAL NEPHRITIS.

Microscopical Examination.—Films made from the pus of the liver and spleen showed slender bacilli, occasionally curved, lying in pairs. They stained irregularly, were negative to Gram's stain and resembled exactly the Bacillus Mallei. No pyogenic cocci were found. Owing to a mistake through which the organs were placed immediately in a weak formalin solution, cultures could not be made.

The small BOWEL showed only moderate fulness of its vessels. The large bowel was more definitely congested and its glandular epithelium stained rather poorly.

The LIVER presented very extensive congestion, most marked around small, scattered abscesses which contained necrotic material, but no great accumulation of leucocytes.* There was also noted slight general increase of fibrous tissue, with areas here and there of more marked fibrosis about the portal system and occasional areas of acute infiltration with small (plasma) cells. The endothelial cells of the portal capillaries were in places markedly enlarged. The blood in the vessels showed evidence of leucocytosis. Amyloid disease was shown in some regions. Sections through a gumma-like, inspissated, cheesy mass situated just beneath Glisson's capsule showed this to consist of a granular material presenting in places shadowy outlines suggestive of leucocytes that had lost their nuclei. Otherwise it was structureless. Apparently it was surrounded on all sides by a fibrous capsule, and its general appearance suggested that probably the mass, originally forming in the liver substance, had reached the surface by extension and destruction of the liver cells. In at least two places fairly vascular fibrous tissue was seen extending from the fibrous capsule surrounding this mass into its interior; but, although the appearance thus presented was strongly suggestive of organization going on in the gumma-like mass, it was not possible definitely to exclude the possibility that this ingrowing fibrous tissue might have been the remains of portal systems which had persisted after atrophy of the liver cells. Films made from scrapings of this cheesy material showed short, stout bacilli corresponding in their morphology and staining reactions to the bacillus mallei, as did necrotic material obtained from the spleen. Attempts were also made to stain the bacilli in sections, and some bodies resembling the bacilli found in the films were seen, but the staining of the bacilli in the tissues was very unsatisfactory, possibly owing in part to the fact that the tissues had been kept for nearly 3 years before the attempt was made.

The PANCREAS showed some congestion, with evidence of intra-

*This apparent scantiness of leucocytes was doubtless due to their having undergone chromatolysis and degeneration. Evidence of chromatolysis was seen in most of the other organs, which showed in the region of the lesions deeply staining nuclear debris.

vascular leucocytosis. Under the microscope its lobulation appeared relatively indistinct and its cells stained rather badly. There was no fibrosis, the Islands of Langerhans were numerous and appeared free from morbid change, and no focal small celled accumulations were visible. Unfortunately the small nodule resembling potash soap was not saved for microscopic examination.

The SPLEEN had the walls of its sinuses thickened and the sinuses themselves moderately full of blood. There was well marked amyloid disease affecting almost exclusively the Malpighian bodies and necrotic foci with poorly staining contents were seen, similar to those present in the liver.

The KIDNEYS showed chronic parenchymatous nephritis of moderate degree, the lumina of the tubules being large and their epithelium somewhat flattened. In addition there were areas of very pronounced congestion in the cortex and some early interstitial change was seen extending inwards from the capsule. Here and there, in the outer part of the cortex particularly, were small, rather well-defined areas of focal, small celled infiltration around some of the veins.

The ADRENALS showed some fulness of the vessels and intravascular leucocytosis. In the medulla were small focal accumulations of small round cells, chiefly perivascular. One vein of considerable size was completely ringed with such an accumulation. There was marked amyloid change, almost entirely confined to the cortex.

Of the LUNGS small pieces only were obtained for microscopic examination. There were in the neighborhood of the bronchi and the vessels scattered small areas of consolidation. In parts the alveolar boundaries were indistinguishable and the exudation stained poorly, resembling abscesses. The microscopic appearances varied considerably, however, in different sections. In one section some emphysema was practically the only abnormality. In other sections a condition of pneumonia was evident. The alveoli in groups were filled with round cells of varying size, the smaller of which appeared to be leucocytes and the larger epithelioid cells, but there was no clear evidence of the presence of fibrin. The vessels were congested. Here and there the alveoli contained air. Some of the alveoli contained abundant red corpuscles mingled with the round cells, but in most of the alveoli red cells were characteristically rare. The condition was one of incomplete hepatisation, apparently rapidly advancing and fairly early. In other places the appearances were suggestive of an ordinary tubercular broncho-pneumonia, though no giant cells were seen.

Among the chief POINTS OF INTEREST in this case are the following:

1. The scantiness of the RASH, its slow evolution and its refractoriness to treatment, may be noticed; also the peculiar white urticaria-like œdema which developed around the lesions. A similar white areola surrounding the skin lesions is described in Banks's case, in which it was still noticeable at post mortem, though in the present case it was transient. Suppuration in a blistered area, which occurred early in the present case, was noticed as an initial feature in Ions's.

2. As regards the DEEPER LESIONS three facts may be noted. (a) Their RESEMBLANCE TO GUMMATA. In the lesions opened at

an early period in their development the essential process was apparently one of breaking down and liquefaction of tissue,* though secondary suppuration occurred. This pus-formation could not, moreover, have been due to a mixed infection following operation; for in the first focus opened, the development of which had been slow, aspiration demonstrated muco-pus before any incision was made. Also, stained coverglass preparations failed to show any micro-organisms in such pus, and the Bacillus Mallei was the sole organism found in the pyæmic abscesses discovered at post mortem. The cheesy, necrotic tissue which formed within the skull was very similar in appearance to a broken down gumma.

(b) The ALTERNATION OF PERIODS OF SLOW, TEDIOUS, LOCAL IMPROVEMENT WITH RAPID NECROSIS OF TISSUE. At times loss of tissue would occur, apparently within 48 hours, which six weeks time would not repair. Antiseptics seemed utterly unable to prevent or control these rapid extensions of the ulcerative process, which occurred even when drainage was of the freest.

(c) The ABSENCE OF ANY MARKED TENDENCY TO MIXED INFECTION. Cultures, taken by Dr. Archibald from a focus that had been opened months before, showed only glanders bacilli and no other bacteria were found in any of the lesions at post mortem. Where other germs were found with the Bacillus Mallei, this was probably due to an admixture with skin bacteria.

3. The EXCEEDINGLY CHRONIC COURSE OF THE DISEASE. It is certain that the disease lasted 20 months, and one or two facts hint at the possibility of even longer duration. It is suggestive that the attack of so-called rheumatism, from which the patient suffered three years before the onset of the final illness, affected chiefly the outer and upper part of the left thigh, i.e. the very region where the large focus developed which first required operation. In view of the subsequent course of events, too, it may be doubted whether the inflammatory focus which developed over the right oleeranon in the Spring of 1900, was really an ordinary bursitis, as it was considered at the time. Such a period of comparative latency is by no means incompatible with what is known of this disease as it affects horses, and later in this paper facts regarding latent human glanders will be adduced.

4. The SIMILARITY OF THE DISEASE TO A CHRONIC SEPTICO-PYÆMIA caused by other organisms.

5. The MODE OF EXTENSION OF THE DISEASE was here in part by the blood and in part by the lymphatics. The disease spread, however, more by the blood stream than by the lymph channels.

6. The DEGREE OF CONTAGION. As is almost invariably the rule, the disease was contracted from horses. In this instance association with the diseased animals was prolonged to between three and four years before definite symptoms of the disease developed. The fact that no other human cases developed among the men associated with

* No doubt in these cases suppuration occurred at first, and liquefactive necrosis came on secondarily in the pent-up purulent exudate. After opening the focus, the secretions discharged externally before much liquefactive necrosis had time to take place in the cellular portion of the exudate.

these horses suggests that the risk for contagion for human beings is but slight.

Two occurrences during the patient's illness are worthy of note, though no stress can be laid on them. The man who chiefly looked after the patient's horses developed a pharyngitis and "catarrh" with a temperature of 99°, some time after the diseased horses were killed, also slight enlargement of the cervical glands. This was not refractory to treatment and in 1905 the man is still in good health. Also the patient's mother-in-law, who lived in the same house and was invalided owing to myocarditis, developed during the first spring of the patient's illness an inflammatory focus over one of the condyles of the humerus, which proved refractory to treatment and finally, suppurating, required incision. Unfortunately no cultures were made and there was no bacteriological examination of the pus. This focus healed promptly and no others developed. She died, however, a few months later, apparently of myocarditis. No post mortem examination was made.

The horses seemed to contract the disease more readily. The contagion, originally confined to one animal, gradually spread to the other horses in the stable, including others purchased afterwards, until, at the time when attention was directed to the horses by the development of the human case, the only horses free from the disease were two that had been purchased but a few months before. The horses drank from a common drinking tub supplied with running water.

Nasal discharge was a marked feature in these cases, but it would seem possible that horses with no symptom of the disease, but which react to mallein, may occasionally communicate the disease to other animals.*

7. The INTERMITTENT GLYCOSURIA. The case in this respect seems to be unique, as a search of the literature fails to reveal the occurrence of glycosuria in any other case. Several possible explanations of the presence of this symptom may be offered. Its concurrence with dyspeptic symptoms suggests a pancreatic origin, but no lesion was found in this organ at autopsy, except a very small necrotic focus. The fact that it seemed to appear at the same time as the intracranial lesion, which developed till at post mortem a large mass was found compressing the occipital lobe, suggests the intracranial lesion as a cause. The extensive changes, evidently of considerable standing, in the liver point to a possible interference with the glycogenic functions of the liver. The fact that it was of slight degree and inconstant hints that it may have been toxic in origin, analogous to the glycosuria which follows the administration of certain drugs. The question of its causation must remain an open one.

8. The ABSENCE THROUGHOUT THE DISEASE OF NASAL AND PULMONARY SYMPTOMS. This, though in marked contrast with the prominence of these symptoms in the animals from which the disease

* Vide Report of the Departmental Committee appointed by the Board of Agriculture of Great Britain which carried out investigations during 1901-1902 to determine this mooted question.

was contracted, is no uncommon occurrence in human glanders, in which cases, as here, the most noticeable feature is often for a long time muscular abscesses. It is interesting to find that although no pulmonary involvement was found clinically, even in the terminal stages, microscopic examination of the lungs showed them to be definitely affected. In several other chronic cases pulmonary lesions were found at post mortem where no mention is made of pulmonary signs clinically.

9. The FAILURE OF THE MALLEIN REACTION. This is a notable feature of the case. Dr. Rutherford is emphatic regarding the reliability of the reaction in animals. He says: "I have never known a case of glanders to fail to react when tested for the first time, nor have I ever known an animal to give a characteristic reaction to the mallein test unless it was infected with glanders."

The dose of Mallein given was one-sixth of that usually employed for a horse, which is 1 c.c. of the concentrated Mallein employed in this case. Only one injection was given. It is unfortunate that at the time of injection the patient's temperature was a little higher than usual (99⅘°), but this is not a sufficient explanation of the utter failure of the reaction. The Mallein was obtained from a reliable firm and the directions given for preparing it for use were rigidly followed.

A possible explanation of this failure may be given. Bonome, in treating his original case, found repeatedly that a dose of 2 minims of mallein failed to produce a reaction, even before the patient had become habituated to the treatment. The dose employed in this case was only 2½ minims, as at that time the writer had no available data as to dosage, and roughly proportioned the dose employed to the weight of the man relatively to the weight of the horse. This amount may well have been insufficient, as it is to be remembered that Bo- me's case was a boy of 16, not a full-grown man. The failure to obtain a reaction in this case is considered to be due to uncertainty as to the dose necessary to produce a reaction in man, of a product whose strength, even for testing horses, is somewhat uncertain.

10. The DIFFICULTY OF DIAGNOSIS FROM CLINICAL SIGNS ALONE. Glanders is, like others of the infective granulomata, a protean disease. We have a good example of this fact in the case we have been considering, as the man and the animals from which he contracted the disease had not a single symptom in common.

11. As to TREATMENT, a life of quiet, avoidance of ex- osure to cold, excision of foci and swabbing of the lesions with pure carbolic acid appeared to be the measures of most benefit in this case. Other antiseptics than carbolic acid seemed to do no good whatever, and internal medication was of no value.

SYNOPSIS OF 156 CASES OF CHRONIC GLANDERS.

In the following synopsis the cases, in which an effort has been made, often unsuccessfully it is feared, to number the cases in approximate chronological order as to occurrence or publication, are divided into three groups:— (A) Cases the nature of which was proved by isolation of B. Mallei, or by producing characteristic glanders on inoculating a donkey, a horse or a male guineapig.* (B) Cases in which the diagnosis of glanders is regarded as fairly certain, though the absolute proof of bacteriological or animal experiments is lacking. (C) Cases probably glanders, considered available for statistical purposes, though the available records of them are imperfect. Several of these doubtless would be included under (A) or (B) if the original reports were accessible.

The above three groups include all the cases available for analytical purposes, but a fourth group, (D), comprises cases which were reported as chronic glanders, and indeed may have been so, but in which the records leave the diagnosis too doubtful to permit their inclusion for statistical purposes. Under (E) is a list of some chronic cases of which the writer has not been able to find any record in the literature at his disposal, save the bare statement that they have been encountered.

Finally, it cannot be claimed that the list of cases of chronic glanders here synopsized is an exhaustive one. Records in three languages only have been accessible, and even these imperfectly. Russia and Cuba alone, perhaps the two countries in which glanders is most prevalent at the present day, might well furnish fifty additional cases, possibly even more.

Moreover, it is to be remembered that the published cases of chronic human glanders are but a small proportion of those which have been correctly diagnosed, and there is reason to fear that the vast majority of cases of glanders in man have been included under some other heading in mortality statistics.

I shall feel that the time spent in ransacking general medical literature to collect those cases will not have been spent in vain if thereby I am able to call attention to the fact that this chronic form of the disease if rare is nevertheless sufficiently frequent to deserve more consideration than it has received in the past, when attempting to diagnose obscure ulcerative and granulomatous conditions.

---

* Cases due to or responsible for other human cases in which the nature of the disease was proved by animal inoculations or cultural methods, are included in this group.

The same order will be followed in considering each case, namely:

Case Number,
Physician in charge, or reporting case,
Reference,
Occupation of patient,
Age,
Sex (only stated if patient is a female),
Symptoms and clinical signs,
Bacteriological findings,
Animal inoculations,
Treatment (only referred when some therapeutic agent was used that was in certain cases thought to be of benefit),
Duration,
Result,
Pathological findings,
Notanda.

GROUP A

Cases the nature of which was proved by isolation of B. Mallei, or by positive results on inoculation of guineapigs, donkeys or horses, —61 cases.

(3)—**Travers's** 1st case. TRAVERS, INQUIRY INTO CONSTITUTIONAL IRRITATION quoted by Elliotson, MEDICO-CHIRURGICAL TRANSACTIONS, XVI, 1830, 171

Veterinary student, injured hand dissecting glandered donkey. Lymphangitis of arm, abscesses, suppuration in lungs, knee joints and kidney; hectic fever. Two donkeys—positive. Duration not stated. Died.

One of the first human cases the nature of which was clearly proved by animal inoculation.

(4)—**Travers's** 2nd case. Ibid.

Coachman, 32, inserted chapped thumb into glandered horse's nose. Rigor, suppurative lymphangitis, submaxillary and inguinal adenitis, nasal ulceration and discharge, emaciation, relapse after apparent cure. Donkey—positive. Incomplete after 2½ years.

Signs of local infection in six hours, lymphangitis 4th day.

(34)—**Anonymous**. Gaz. des Hôpitaux, Dec. 31, 1842, translated in Lancet, 1842-43, I, 750.

Stableman, 36, cared for glandered horses. Coryza, nasal and pharyngeal ulceration, abscesses all over body, rigors, pleurisy, adenitis, diarrhœa. Dog refractory; two horses inoculated and developed glanders. Mercurial inunctions. Over six weeks. Died. Pleural adhesions, chest wall perforated by abscesses, liver and spleen enlarged, involvement of frontal and sphenoidal sinuses.

Note interesting inoculation of another horse with matter from small-pox pustule with negative results. Inoculation of urine failed to give glanders to horse.

(45)—**Sédillot**. Reported to Academy of Sciences (Paris) Oct. 11, 1847, abstr. in London Med. Times, XVII, 1847-48, 35.

Soldier, 26, groomed several glandered horses. Malaise, 'ague', abscesses of extremities, cough, diarrhœa, caries of head bones, gangrenous ulceration of throat and larynx, phlegmon. Three horses inoculated developed glanders. Two years. Died. Lobular abscesses of lungs, spleen, liver; ulceration of trachea, purulent thrombosis of saphena vein.

Note statement that the unhealthy aspect assumed by the wounds of several other patients when washed with sponges used by this patient, cleared up all doubt as to the nature and contagious character of the disorder!

(90)—**Richard and Foucher.** Archiv. Gén. de Méd., XXVII, 1851, 411.

Groom, 28, cared for horse with glanders dead over ten years previous to onset of his illness. Small abscesses near anus, multiple swellings, some suppurating; sharp pricking pains over right tibia with rose-red papules surrounded by yellowish urticarial areola, then bullæ and slight gangrene. Horse inoculated died in four or five days without clinical signs, but at autopsy showed acute pulmonary and nasal glanders. Three months. Supposed cure.

Note sequence of events in anterior tibial region.

(76)—**Anonymous,** abstracted from a French Journal in Lancet, 1865, II, 248.

Blacksmith, sleeping in stable, lost horse from fœtid diarrhœa without characteristic symptoms. He developed multiple tumors, pus from one of which inoculated into horse and donkey was positive. Duration not stated. Died. Multiple soft-ish tumors in lungs of man and animals inoculated.

(85)—**Gaujot,** from Clément, Thèse de Paris, 1881, quoted by Prieur, Thèse de Paris, 1898, and Rémy, Arch. de Méd. Expérimentale, IX, 1897, 144, &c.

Blacksmith, origin of disease not stated. Multiple abscesses healing and relapsing. Guineapig—positive. Thermocautery, iodine baths, pure phenol to lesions. Incomplete in 19 months.

An interesting forecast of Straus's procedure, guineapig being employed for diagnostic purposes.

(90)—**Lagrange.** Journ. de l'Anat. et de la Physiol. 1884, No. 1, 24, abstracted in Jahrb. des gesammte Med., 1884, I, 607.

Dragoon, 22, cared for glandered horse while abrasion of little finger. Abscesses, swelling of knee and ankle, chills, nosebleed. Donkey—positive. Cauterization, arm amputated after generalization of poison.

Incomplete: duration not stated.

(95)—**Kernig.** Zeitschr. f. klin. Med., XII, 1887, 191.

Physician-pathologist, thought to have infected old dissection wound at glanders autopsy. Typhoid-like attacks, bronchitis, dry pleurisy, multiple abscesses, albuminuria. B. Mallei. Guineapigs—positive. Mercurial inunctions. Twenty months. Died. Lues, amyloid disease, one splenic nodule, lungs negative.

(96)—**Bucquoy.** Gaz. Hebd. XXXV, 2, 1888, abstr. in Schmidt's Jahrb., CCXVIII, 140.

Liveryman, 47, had dealings with glandered horse. Multiple abscesses, diarrhœa, nasal discharge, tough black expectoration. B. Mallei isolated. Donkey—positive at autopsy. Six months. Died. Abscess in right frontal lobe and outside left parietal dura, one small pulmonary nodule.

(97)—**Proust.** Revue d'Hygiène, X, 1888, 12, abstracted in Schmidt's Jahrb., CCXIX, 197.

Coachman, cared for glandered horse while slight finger wound. Multiple abscesses, nasal discharge, pharyngeal ulceration, diarrhœa. B. Mallei. Animal experiments—positive. Six months. Died. Pulmonary nodules, inf[illegible]s of brain and spleen.

(100)—**Gold's** 151 case. Berlin. klin. Woch., 1889, Jahr XXVI, 672, also Kernig's paper above quoted.

Countryman, 30, origin of disease unknown. Bronchitis, foci sometimes suppurating in all extremities. Guineapigs—positive, B. Mallei from them. Mercurial inunctions, opening and cauterization of sinuses. Three months.

Definite cure, well three years later. Gold had 24 previous cases, all fatal. He attributes cure exclusively to inunctions, but this is doubtful.

(101)—**Jakowski.** Ztschr. f. klin. Med., XVIII, 1891, 559. V. also Schmidt's Jahrb. CCXXV, 135.

Stable boy, 19, predecessor likewise had glanders. Chill, pustules on thigh, multiple abscesses; relapse, involvement of left testis, inguinal adenitis. B. Mallei pure culture from freshly opened foci. Guineapigs positive. Testis removed. Twelve months.

Probable cure; well six months later.

(102)—**Kondorski.** Vratch, 1891, quoted by Rémy, Arch. de Méd. Expér., IX, 1897, 144.

Countryman "contracted glanders". Multiple abscesses, fever, emaciation. Guineapigs—positive, from them B. Mallei. Mercurial inunctions, cauterization with nitric acid. Two months.

Incomplete, great improvement. Here too, energetic local measures were used in addition to inunctions.

(103)—**Besnier's** 1st case. Ann. de Dermatol. et de Syphilographie, série 3, II, 1891, 296.

Stablehand, 25, "contracted glanders". Cough, night sweats, abscesses of arm, papulo-pustules on face becoming serpiginous ulcers, invasion of palate, nose and lacrymal passages. B. Mallei. Donkey—positive. Antisyphilitic treatment useless. Five years. Died. Kidneys congested and lardaceous-looking, lungs normal.

(104)—**Besnier's** 2nd case. Ibid., série 3, III, 1892, 277.

Man, 74, denied contact with glanders. Obstinate bronchitis, watery nasal discharge, pustules on wine colored area over bridge of nose, nasal ulceration, diarrhœa, emaciation. B. Mallei. Guineapigs—positive. Ichthyol. Twenty-seven months.

Incomplete. Mixed infection.

(105)—**Hallopeau** and **Jeanselme.** Ann.de Dermatol.et de Syphilographie, série 3, II, 1891, 273. *V.* also Brit. Journ. of Dermatol, 1893, 250.

Carter, 24, cared for glandered horse. Fever, nasal discharge, joint pains, multiple stubborn abscesses; apparent cure three years; fresh abscesses, swelling of lacrymal sacs. ulceration of nose, palate and lips, septum perforated, phlegmon and pustules of face, conjunctivitis, diarrhœa, jaundice, albuminuria, fœtid diarrhœa, ascites. B. Mallei. Donkey and guineapigs—positive. Antisyphilitics useless. Six years. Died.

Three years latency; sometimes mixed infection with staphylococci, sometimes pure culture B. Mallei. Mercurial treatment of no benefit.

(106)—**Hertel.** Charité-Annalen, XVI, 1891, 268.

Carter, 24, father dead of tuberculosis, had cervical adenitis since childhood; origin of glanders not stated. Purpura, swelling of limbs and body, laryngeal and pulmonary symptoms with tubercle bacilli in sputum, nosebleed, double otitis, general phlegmon spreading from left ear. Guineapigs and field mice—positive at autopsy when inoculated with pus from liver abscess. Three months. Died. Autopsy findings complicated with those of tuberculosis.

An interesting case of combined infection by two of the infective granulomata.

(107)—**Gold's** 2nd case. Berlin. klin. Woch., Jahr XXVIII, 1891, 987.

Peasant, 32, origin of contagion unknown. Chills, diarrhœa, phlegmon over malleolus, bronchitis, multiple abscesses of extremities. Guineapig—positive, and from it B. Mallei. Mercurial inunctions and local surgical measures as in Gold's 1st case. Two months.

Probable cure, well nearly a year later. This second successful case speaks well for Gold's treatment.

(108)—**Neisser.** Berlin. klin. Woch., XLI, Jahr XXIX, 1892, 321.

Stableman, 20, cared for glandered horse, which died two years before onset of illness. Conjunctivitis from sore at inner angle of eye, otitis media, nasal discharge and ulceration, perforation of septum, laryngeal ulcer, (suppurative) adenitis, serous pleurisy. Guineapig—positive. Potassium Iodide. Eye healed rapidly under tuberculin. Nineteen months. Incomplete.

Note the apparent two years incubation—doubtless due to an indefinite onset followed by a long latent period, and apparent benefit from tuberculin.

(109)—**Pepper.** Trans. Assoc. of Amer. Physicians, VII, 1892, 350.

Physician, did experimental work with material from human glanders while abrasion of hand. After seven days pimple at site of abrasion, showing bacilli when excised. Much induration later about incision carried through seemingly sound tissue. Six weeks. Probable cure, well some months later.

This case shows the all-importance of prompt radical surgical measures. Note slowness of healing; incubation seven days. In view of direct exposure of abrasion to B. Mallei and presence of bacilli morphologically identical with B. Mallei in the lesion, this case is included under group (A), though the antiseptic measures at operation had killed the germs, preventing successful cultural and inoculation experiments.

(111)—**Tedeschi.** Virchow's Archiv., CXXX, 1892, 361.

Porter, had dealings with glanders, multiple abscesses, necrosis of bones above ankle, nervous symptoms. B. Mallei pure culture at autopsy. Guineapigs—positive. Mercurial inunctions useless. Over seven months. Died. Pus collections between dura and skull; purulent thrombi in sup. long. sinus; osteomyelitis in left tibia and fibula; pleural adhesions, liver adherent to diaphragm, parenchymatous nephritis, splenic abscesses.

Note combination of bone and meningeal lesions.

(112)—**Mader.** Jahresb. der Krankenanstalt Rudolfstiftung in Wien, 1891, abstracted in Centralbl. f. klin. Med., XIII, 1892, 1010.

Stableman, 61, slept in stable with glandered horses, painful swellings and phlegmon of legs, marasmus, fluid in knee joints, left pleural effusion, multiple foci. B. Mallei. Over two months. Died. Nodules in lungs, pleura, spleen and liver.

(113)—**Holmes,** Journ. American Med. Assoc., XXI, 1893, 234.

Farmer, 22, treated two glandered horses. Felon of finger, multiple abscesses, edges sometimes covered with shotty granulations, bone involvement, adenitis; sharp stinging pain first localised the foci. Guineapig—positive. Prompt excision or cauterization immediately foci were localised by the occurrence of sharp, stinging pain. Two and a half years.

Definite cure, well over a year later. Note stinging pain marking onset of foci, probably due to embolism, shotty granulations on edges of abscesses and success following persistent radical surgical treatment—20 operations under general anæsthesia in two and a half years.

(115)—**Lambrette.** Archives Méd. Belges, Oct. 1893, abstr. in Ctbl. f. inn. Med., XV, 1894, 319.

Man, 22, origin of disease unknown. Multiple abscesses, pus in left elbow-joint, ulceration of nose. B. Mallei and streptococci. Three months. Died.

(117)—**Gralewski.** Vratch, 1893, abstracted by Rémy in Archiv. de Méd. Expérimentale, op. cit.

Old man looked after son ill with fatal acute glanders. Pustules first on arm and neck, then general, ulcer on hand, abscess of neck. Nature of son's disease proved experimentally. Phenol, cauterization, mercurial inunctions. Two and a half months.

Supposed cure. Woman washing son's clothes a' developed glanders.

(118)—**Meisseieff.** Congress of Russian Physicians, Section of Path. Anat., meeting of Dec. 30, 1893, abstracted in Ann. de Dermatol. et de Syphilographie, série 3, V, 1894, 562.

Man, 22, origin of disease not stated. Multiple small abscesses, nasal ulceration. B. Mallei and streptococci. Guineapigs and dogs—positive. Lasted "a very long time". Died. Numerous hepatized foci in lungs, nut sized nodules in kidneys, venous thrombosis.

(119)—**Bonome.** Deutsche med. Woch., XX, 1894, 725.

Stable boy, 16, had specially intimate dealings with glandered horses. Chills, pains in legs, nasal discharge, palate ulceration, cervical adenitis Repeated typical mallein reactions, in time diminished to nil. Duration not stated. Incomplete.

An interesting case showing effect of mallein treatment on human glanders; unfortunately incomplete.

(120)—**Babès's** 1st case. Semaine méd., 1894, II, 451.

Groom, caring for glandered horses; pleurisy; recovery for over five years, then multiple refractory abscesses. B. Mallei and streptococci at autopsy. Six years. Died. Subpleural pus collections and hæmmorrhagic infarcts, calcified encapsuled nodules in lungs with very old pleural adhesions opposite.

A convincing case of glanders latent over five years, during which time patient had been ox-herd in a region in which there were no horses.

(121)—**Babès's** 2nd case. Ibid.

Soldier, had long had no dealings with horses. He had old cicatrices on front of leg which ulcerated and became gangrenous on traumatism. Showed B. Mallei and staphylococcus aureus. Duration and result not stated.

(122)—**Babès's** 3rd case. Ibid.

Groom, dead of chronic nephritis, many broken down pulmonary nodules showing typical B. Mallei culturally.

(125)—**Nencki and Pruszynski.** Gazeta Lekarska, 1896, 268, quoted by von Baracz. Virchow's Archiv., CLIX, 490 et seq.

Physician, origin of disease not stated. Chills, pains in legs, a few abscesses, pains over left kidney, suppuration of left knee. B. Mallei found and guineapig—positive, in case of physician who infected finger operating on knee and died of acute glanders. Potassium iodide. Six months. Died.

Note acute glanders in surgeon operating on this patient.

(126)—**Buschke.** Arch. f. Dermatol., XXXVI, 1896, 323, abstracted in Rev. des Sciences Médicales, 1897, XLIX, 617.

Stablehand, 73, had to do with glandered horses. Stubborn ulcers of hand,

axillary and inguinal adenitis. Guineapig—positive. Excisionof ulcers, thermo cautery, mallein. Eighteen months. Definite cure, well 20 months after.

Note failure of mallein reaction; mallein was only used however after excision.

(127)—**Joubert.** Thèse de Paris, 1897.

Horseflayer, 37, scratched finger skinning unknown horse. Lymphangitis, abscesses, nosebleed, slight papular eruption, pleurisy, bronchitis, phlegmon of extremities, purpuric spots on chest. B. Mallei. Five months. Died. Nodules in spleen, tubercles and abscesses in lungs.

(128)—**Rémy**. Archiv. de Méd. Expérimentale, IX, 1897, 144.

Horseflayer, 42, pricked finger skinning horse. Lymphangitis, axillary adenitis, abscess of calf. B. Mallei, streptococci and staphylococci. Guineapig—positive. Local baths of iodine and potassium iodide, curetting, zinc chloride 1-10. Fifteen months.

Supposed cure. Incubation four days.

(129)—**Von Strube.** Charité-Annalen, 1897, 213.

Stablehand, 26, worked among glandered horses. Fever, headache, vomiting, inguinal adenitis, splenic enlargement, diarrhœa, nosebleed; convalescence, ecchymoses on eyelids, fever, general adenitis, facial phlegmon, discharge and ulceration of left nostril, nodules on forehead, arms and chest, nodules about right testis. B. Mallei. Guineapig—positive. Two and a half months. Died. Firm nodules in muscles, internal organs unaffected,faucial ulceration, hepatitis, splenic enlargement.

Note attack closely resembling typhoid but with absence of Widal and presence of inguinal adenitis, also unusual firmness of muscle foci and absence of involvement of internal organs.

(130)—**Marsh and Berry.** Trans. Path. Soc., London, XLIX, 1897-98, 20.

Painter, 37, under treatment for syphilis at several hospitals during 16 years, origin of glanders unknown. Phlegmon of face, gangrene about nose and forehead; nasal discharge, ulceration of hard palate, firm, yellow, papular eruption, perforation of septum, laryngeal ulcer above cords. Died. Scarring of soft palate, nodule in parietal pleura, firm pulmonary nodules, mainly superficial, one splenic nodule.

B. Mallei cultivated at autopsy.

This case is here inserted with some hesitation, but it seems probable that the symptoms of previous 'syphilis' were in large part due to glanders.

(131)—**Gourfein, Marignac and Vallette.** Revue Médicale de la Suisse Romande, 1898, 737. Arch. d'Ophthalmol., 1898, 699, abstr. in Rev. des Sciences Méd., 1898, LII, 285.

Country girl, aged 12. Lacrymal fistula 12 days after injury, submaxillary and preauricular adenitis, after four months loss of sight from involvement of eye. B. Mallei. Guineapig—positive. Over four months. Died.

Considered tubercular previous to animal experiments; the presence of old glandular scars in the neck suggests a much longer duration than four months or a double infection.

(132)—**Sharkey and Scott.** Lancet, 1898, II, 306.

Stablehand, 32, in charge of 'healthy' horse. Tibial periostitis, emaciation, signs at base of right lung, farcy buds, phlegmon of right face, ulceration of nose and palate. B. Mallei (pure culture). Over six months. Died. Pea-sized subpleural nodules, a few shallow non-indurated stomach ulcers, spleen enlarged.

(133)—**Rose and Sprawson.** Lancet, 1898, II, 876

Stableboy, 19, cared for several glandered horses. Stubborn abscesses, transient coryza, pharyngitis, dead bone in forehead. B. Mallei. Guineapig—positive. Lesions opened up, scraped and swabbed with liquid phenol. Seventeen months Supposed cure.

Note benefit from application of liquid phenol to lesions when thoroughly exposed.

(134)—**Emma Musson.** Journ. American Med. Assoc., XXXIII, 1899, 1329.

Married woman, 54, origin of disease unknown Tonsillar enlargement, submaxillary and cervical adenitis for a year, walnut-sized nodule in pharyngeal vault, glosso-epiglottic nodules, inflammatory uterine polyp, dysentery, enlargement of lingual tonsils, left axillary and right inguinal adenitis: recurrence in throat repeatedly, abdominal dropsy. Guineapigs—positive after nearly three years, from them B.Mallei. Great improvement from removal of tonsils and pharyngeal growth and Pyoktannin, one per cent; apparent cure after removing recurrent growth, thermocautery and pyoktannin. Three years. Died.

First considered sarcoma of tonsils; note the unusual throat symptoms, dysentery and uterine nodule, with persistent recurrence in throat and final death.

(135)—**Batko's** 1st case. Wien. klin. Woch., 1898 95 ..

Stableman, 30, treated glandered horses. Nodules on neck, abscesses in neck, parotid region and right calf, emaciation, cough, right pleurisy, enlargement of lymph glands, liver and spleen, laryngitis. B. Mallei. Mallein negative, scraping foci, thermocautery. Over one year.

Incomplete.

(136)—**Batko's** 2nd case. Ibid.

Wife of (135), aged 50, dressed husband's abscesses. Abscess under right eye, fever, despondency, right clavicular glands and spleen enlarged, bronchitis. B. Mallei. Mallein negative, scraping and cauterising foci. Over four months.

Incomplete.

(137)—**Batko's** 3rd case. Ibid.

Girl, 2, rickety, child of last two, probably contracted from (135). Nasal inflammation and discharge, cervical adenitis, slight emaciation. Not investigated baeteriologically. Over eleven months.

Incomplete.

(138)—**Batko's** 4th case. Ibid.

Girl, 4, child of (135) and (136), probably contracted from (137). Nasal inflammation and discharge, cervical adenitis, transient phlegmon of left external ear. Not investigated baeteriologically. Over three months. Incomplete.

A unique series showing how a whole family may be infected from one human case.

(139)—**Von Baracz.** Virchow's Archiv., CLIX, 1900, 490.

Farmhand, 58, contact with glanders unknown. Two days after tooth drawn swelling of the eyes with nasal and aural discharge, submaxillary adenitis; apparent recovery for five years after operation, then jaundice, phlegmon of nose, perforation of septum, abscesses, diarrhœa, amyloid disease. B. Mallei. Guineapig—positive. Arsenic, mercurial inunctions with temporary improvement. Fifteen years. Died.

Five years of lateney and long duration in a case in which the mucous membranes were affected before the skin, also apparent onset two days after drawing of tooth by shoemaker.

(140)—**Van de Velde.** La Belgique Médicale, Dec. 15, 1898, abstr. in Baumgarten's Jahrb., year XV, for 1899, 332.

Child, 3, played about smithy contaminated with glanders. Severe anæmia, fever, abscess of forehead, nasal discharge and ulceration, gangrenous ulcer of palate, parotid and submaxillary adenitis. Guineapigs—positive (they also reacted to mallein). Duration and result unstated.

(141)—**Nicolle and Dubos.** La Presse Médicale, Oct. 18, 1902 abstracted in New York Med. Record, November 15th, 1902, 786.

Farmer, had to do with glandered horses. Stinging pain as if from foreign body in eye (none seen), tumors near jaw, in left calf and elsewhere. B. Mallei. Recurrence after extirpation; rest, forced feeding, etc., useless; good results from 190 c.c. bovine serum in two and a half months. Nine months. Probable cure, well six months after.

Note favorable result attributed to bovine blood serum.

(142)—**MacCallum.** Beitr. z path. Anat. u. allg. Pathol., XXXI, 1902, 440, abstr. in Schmidt's Jahrb., CCLXXVIII, 1903, 233.

Pathological assistant, 36, pricked thumb with syringe containing B. Mallei. Double pneumonia and pleurisy. B. Mallei at autopsy. Two months. Died. Numerous small pulmonary and pleural nodules, also in spleen and kidney.

(143)—**Jenckel.** Deutsches Ztschr. f. Chir., LXXVI, 1904, 130.

Pathological assistant helped at human glanders autopsy while finger wound. Lymphangitis of arm, asthenia, suppuration of epitrochlear gland with limited phlegmon about lesion. B. Mallei in pure culture. Guineapig—positive. Six weeks. Definite cure, well four years later.

Incubation seven days; numerous previous ordinary wound infections had never weakened the patient to a similar extent, nor had they ever caused suppuration of epitrochlear gland.

(144)—**Zieler's** 1st case. Ztschr. f. Hygiene, XLV, 1903, 310.

Stableman, 30, contact with glanders unknown. Ulcers in mouth and nose, abscesses on cheek and extremities, variable painful joint swellings (no suppuration), fever, fatal lung involvement, considered tubercular. B. Mallei. Guineapig—positive. Thermocautery healed some abscesses, mallein no notable results, mercurial injections. Twenty-eight months. Died.

Unfortunately autopsy findings are so cursorily mentioned that no conclusion can be drawn as to whether final pulmonary involvement was tubercular or glanderous; probably it was the latter. Note apparent failure of mallein reaction and presence of virulent B. Mallei in mouth after lesions there healed.

(145)—**Zieler's** 2nd case. Ibid.

Man, no known contact with glanders. Ulcer of right lower leg leaving radiating scar, suppuration of right submaxillary lymph glands, mouth ulcers, perforation of hard palate, right lacrymal fistula, nasal granulations, emaciation, transient inflammatory joint swellings, phlegmon of face, destruction of upper lip and end of nose, pustular rash about face, perforation of septum. B. Mallei. Guineapig—positive. Potassium iodide and ung. hydrarg. useless; focus excised healed promptly. Thirty-five months. Died. Caseation in gland removed, caseous pulmonary nodules, especially near pleura, and infarcts, lungs containing only B. Mallei; liver and kidney fatty, mesenteric glands swollen.

The tubercular appearance of the lung lesions was proved bacteriologically to be glanderous.

(146)—**Zieler's** 3rd case. Centralblatt f. Chir., March 26th, 1904, 362.

Veterinary student, 21, dressed abscess for glandered horse a year previous to apparent onset. Abscesses of left thigh, occiput and arm, dead bone in head of fibula and frontal bone, frontal purulent pachymeningitis at operation, nasal and laryngeal catarrh, cervical adenitis. B. Mallei in pure culture. Animal experiments—positive. Over eleven months. Probable cure.

Repeated causeless rises of temperature two years after apparent recovery forbid this case to be considered a definite cure. Note relative recovery after operation on extradural lesion.

(147)—**Stuart**, Annals of Surgery, July 1904, 109.

Female physician pathologist, 27, did autopsy on glandered guineapig, while a small wound on hand [illegible] severe general pains especially about diaphragm, abscesses, adenitis, rigor, purp[illegible] spots on back and abdomen. B. Mallei in pure culture. Guineapig—positive. Excision of foci or pure phenol to swab foci and to prevent infection of inc[illegible]ons. Sixteen months. Probable cure, well several months later. Incubation six days.

Note satisfactory results from excision and use of pure phenol on lesions.

(148)—**Dupuy** and **Thiry**. Journ.de Physiol. et de Pathol. Gén., III, 231, abstr. in Baumgarten's Jahrb., year XVII, for 1901, 264.

Man, cleaning out crib of his glandered horse, wounded finger. Wound infection. B. Mallei. Thirteen injections bovine serum. Six months. Supposed cure.

Recovery attributed to bovine serum, but the case was a relatively mild one.

(150)— **Reyes, Bartlett** and **Shattuck**. Wherry on Human Glanders, &c., Report No. 24, United States Government Laboratories—Biological Laboratory.

Clerk and liveryman, 38, lost several horses from glanders. Chills, two abscesses, general papulo-vesicular rash, nasal ulceration, phlegmon of nose. B. Mallei in pure culture. Guineapig—positive. Nine months. Died. Subpleural tubercles in pneumonic areas, liver and spleen large.

Reported as an acute case, but more probably chronic with a final acute exacerbation.

(151)—**Tait** and **Cheney**. California Journ. of State Medicine, July 1905, 220.

Farmer, 52, origin of disease not stated. Multiple abscesses, 'colds', final acute pulmonary infection. B. Mallei. Inoculations—positive. Four and a half years. Died.

(152)—**Lebredo**. Revista de Medicina y Chirugia, Havana, IX, Nos. 16 and 17, abstr. in Journ. American Med. Assoc., July 31st, 1905.

Origin of disease not stated. Multiple abscesses, suppurative inguinal adenitis. B. Mallei. Final focus excised. Over one and a half years. Supposed cure.

(153)—**Cope**. London Veterinary Record, Aug. 19th, 1905, 143.

Stableman, 45. Employers denied glanders among horses, but four were in isolation at inquest No known abrasion; ordinary cold and aching limbs, nodule

and phlegmon of leg, weakness, emaciation, fever, slight abscesses of extremities including knee-joint. B. Mallei. Over two months. Died. Pea-sized pulmonary nodules especially in left lower lobe; signs of septicæmia.

(154)—**McCullough.** Unpublished Canadian case in Northwest Territories.

Man contracted glanders from his work horses; 50 abscesses on extremities opened in four months. Stated recovery. Died of 'lung trouble' several months later. Diagnosis verified by Dr. Bell, Government Bacteriologist for Manitoba. Over ten months. Died.

Note large number of abscesses, apparent recovery, death from what was probably pulmonary glanders.

(155)—**Robins** and **Bell.** Present paper.

Farmer, 46, cared for glandered horses four years. Typhoid-like onset with two acne-like pustules on forehead, obstinate multiple abscesses (of lower extremities), glycosuria, submaxillary and cervical adenitis, caries of occipital bone with extradural curdy focus, amyloid disease, pyæmia. B. Mallei in pure culture from focus opened months previously. Guineapigs—positive. Slitting up and scraping abscesses. Mallein reaction failed; pure phenol to one developing phlegmon with good effect. Twenty months. Died. Multiple abscesses in spleen and liver, scattered necrotic small pulmonary consolidations, granuloma of dura compressing left occipital lobe, amyloid disease, acute colitis, acute fibrinous perihepatitis and perisplenitis, one small potash-soap-like nodule in pancreas.

Note glycosuria, apparently unique in the history of glanders, absence of tendency to mixed infection and failure of mallein reaction. Pure phenol was the most satisfactory local application.

GROUP B

Cases considered to be in all probability glanders, though experimental proof, as in group A, is wanting.—76 cases.

(1)—**Schilling.** Rust's Magazin f. die gesammte Heilkunde, XI, 1821, 480. Quoted by Elliotson, Medico-Chirurgical Transactions, XVI, 1830, 171.

Soldier, 34, washed noses of glandered horses. Rheumatic pains, phlegmon and gangrene of face, pustular rash on forehead, arms and legs; offensive nasal discharge. Seven weeks. Died. Gelatinous masses in tissues (thymus region), abscesses in muscles.

Generally considered the first indubitable case of human glanders published.

(2)—**Weiss.** Ibid.

Stableboy, 19, cared for glandered horses. Suppurative cervical and inguinal adenitis, general pustular rash, emaciation, purulent discharge from ulcerated nares, melæna. Several weeks. Died.

(3)—**Travers's** 3rd case. Travers Inquiry into Constitutional Irritation, quoted by Elliotson, ibid.

Veterinary surgeon, inoculated thumb abrasion dosing glandered horse. Abscesses, suppurative axillary adenitis. Blue pill. Duration not stated. Supposed cure.

(6)—**Hart.** Quoting Travers on Constitutional Irritation in Lancet, 1830-31, II, 14.

Blacksmith's helper, contact with glanders not stated. General symptoms, acute rheumatism, focus on nose, nasal discharge, pustules in various regions, phlegmon of elbow. Quinine. Over two months. Died. Lungs engorged in places.

(8)—**Eck.** Med. Zeitung, May 1837, Nos. 18 and 19, translated in Dublin Journ. of Med. Science, XII, 1838, 79.

Lancer, 25, cared for glandered horses, keeping h[illegible]d in manger. 'Ague', pains in extremities and boil-like tumors, some suppurat[illegible]; delirium, facial spasm, coma. Mercurial inunctions to tumors. Two months. Died. Chocolate fluid infiltrating muscles, two superficial pus collections in brain.

(9)—**Hardwicke's** 1st case. British Ann. of Med., No. 7, Feb. 17, 1837, 196, abstracted in Forbes' Med. Review, XIII, 1842, 34.

Patient had joint pains, inflammatory foci and abscesses of extremities, nasal involvement. Over four months. Died.

(10)—**Hardwicke's** 2nd case. Ibid.

Patient had inflammatory foci and abscesses, nasal involvement. Over fourteen months. Died. One of Hardwicke's cases showed at autopsy ulcers in trachea, larynx and epiglottis, also small (superficial) pulmonary abscesses.

(11)—**Laugier.** Bull. de l'Acad., Sept. 15, 1839, 1037, abstracted in ibid.

Negro, origin of disease not stated. 'Rheumatism', numerous abscesses on extremities. Over five months. Sudden death when apparently convalescent. Nasal mucosa infiltrated and ulcerated and septum perforated, though no nasal symptoms during life.

(12)—**Velpeau** and **Bouillaud.** Bull. de l'Acad. Roy., Dec. 15, 1841, abstracted in Forbes' Med. Review, XIII, 1842, 538.

Groom, 17, cared for glandered horse. 'Swelling' on upper chest, facial phlegmon and slight gangrene; delirium, pustular rash on face and limbs, abscesses right forearm, ulceration of nares and pharynx. Six weeks. Died.

(13)—**Wade.** Dublin Med. Press, X, 1843, 67.

Man, 50, cut thumb while skinning glandered horse. Wound infection, epitrochlear and axillary adenitis. Apparent recovery; sudden sharp pain in eyelid preceded abscess there; abscesses, joint inflammations, phlegmon of nose, nasal discharge, pustules on head and face. Over two months. Died.

Note pain in eyelid, probably marking onset of embolism there.

(14)—**Tyrrell** and **Burgess.** Lancet, 1837-38, I, 356.

Groom, 33, cared for glandered horse while finger abrasion. Suppurative lymphangitis, non-suppurating nodules in left leg, severe aching pains in extremities, despondent, hoarseness and cough. Iodides. Four and a half months. Incomplete.

(19)—**Heustis.** American Journ. of Med. Sciences, XX, 1837, 347.

Boy, 12, said to have cut finger assisting at autopsy on glandered horse. Painful non-suppurative swellings, suppuration in ankle joints, pleurisy, phlegmon of face, elbow and one hand, gangrene of lip, farcy buds on face and elbow; cough preceded and accompanied illness. Ten months. Died.

Probably first case of chronic glanders on American Continent. Chronic cough preceding illness suggests either combined tuberculosis and glanders or a longer duration of the glanders than supposed.

(20)—**Lohmeyer.** Army Medical Reports (? for Prussia), 1834, quoted from Eck, op. cit.

Soldier, 23, had charge of two glandered horses while thumb abrasion. Suppurative lymphangitis, axillary adenitis, abscesses and sloughy tumors, phlegmon of left ankle and right wrist, emaciation, pustular eruption on face and chest. Cinchona, red oxide of mercury to ulcers, mercurial inunctions to tumors. Seven weeks. Died

(22)—**Grenzmer.** Reports of the Board of Health for district of Marienwerder, quoted by Eck, op. cit.

Groom, 27, cared for glandered horses. Malaise and general pains, doughy suppurating tumors on limbs, septic temperature, sweating. Local inunctions of mercury useless. Improved under iodine locally and internally. Over four and a half months. Incomplete.

(23)—**Albin Gras.** Rev. Méd. franc. et étrangère, Jan. 1837, translated in Lancet, 1837-38, I, 492.

Veterinary surgeon, 29, introduced abraded finger into an abscess just opened on glandered horse. Wound infection, epitrochlear suppurative foci, inflammation of elbow joint, then knee. Twenty-seven months.

Incomplete. Patient knew of many veterinary surgeons similarly affected. Incubation a few days.

(24)—**Elliotson.** Lancet, 1837-38, II, 524.

Cab-driver, 57, had glandered horse. Severe pains in limbs, sweating, multiple abscesses, phlegmon of foot. Over seven months.

Incomplete. Incubation under three weeks.

(25)—**Jobert** and **Lenepveu.** L'Expérience, Jan. 1839, abstracted in Forbes' Med. Review, VIII, 552.

Groom, 50, worked among glandered horses. Wandering pains, multiple abscesses, transient cough and ropy expectoration, rigor, phlegmon of forehead, discharge from right eye, a few pustules on right eye, inguinal adenitis, ulceration of larynx and one nostril. Iodinetted ointment. Eight months. Died. Bronchopneumonia, foci in liver and spleen.

(26)—**Ions.** Lancet, 1838-39, II, 144.

Veterinary student, had glandered horse snort in face. Purulent discharge from blister, nasal ulceration and discharge, dyspnœa, sweating, great prostration. Creasote, m. 2 to ounce nasally, did much good. Six weeks. Incomplete. Incubation 48 hours.

(27)—**Alexander's** 1st case. Hufeland und Osann's Journal, 1835, B. 2, h. 2, Forbes' Med. Review, 1836, II, 241.

Lancer, 40, had charge of glandered horse. Foci in forearm, left knee and calf, cough, night sweats, emaciation, diarrhœa. Ung. hydrargyri. Over four months. Died. Broncho-pneumonia and tubercles in lungs.

(28)—**Alexander's** 2nd case. Ibid.

Artilleryman, 19, worked among glandered horses. Pain in side, multiple foci, facial erysipelas and gangrene, adenitis, nasal discharge, eruption of bloody bullæ. Eight months. Died. Lungs adherent, show superficial tubercles centrally softened; laryngeal and bronchial ulceration.

(30)—**Stanley** and **Brush.** London Med. Gazette, XXVI, 1839-40, 105.

Knacker, 30, had to do with glandered horses, injured finger. Wound infection, suppurative lymphangitis, rigors, phlegmon of face, ulceration of lips, larynx and fauces, dyspnœa, delirium. Three kittens inoculated lost condition, one had discharge from eyes and mother cat developed snuffles. Quinine useless. Nodules scarcely ulcerated in nares, small apical tubercles like those in glandered horse; splenic abscesses and pus in splenic vein. Incubation 24 hours.

Patient's nurse died of acute glanders contracted from him.

(31)—**Bouley.** Tardieu, Thèse de Paris, 1843, abstr. in Arch. de Méd. Expérimentale, 1897, 144.

Veterinary surgeon, 26, cut finger during autopsy on glandered horse. Multiple abscesses cauterized with red-hot iron. Sixteen months.

Definite cure. Lived 45 years after. Incubation 15 days.

(32)—**Tytler.** London & Edinburgh Journ. of Med. Science, 1841, I, 413.

Cab-driver, 26, cared for glandered horses. Rheumatic pains, abscesses in legs, phlegmon of scalp and cheek, one-sided nasal discharge and ulceration, faucial ulceration, laryngitis; delirium. Cinchona, creasote internally. Two months. Died. Tracheal ulcer.

(33)—**Mahood.** Dublin Med. Press, VII, 1842, 100.

Housewife, lived in house with two glandered horses and helped care for them. Boggy suppurating tumors on all extremities. Three months. Incomplete.

Husband contracted acute glanders, eight weeks after his wife, possibly from her, and died of it.

(35)—**Tardieu's** 1st case. Arch Gén. de Méd., Dec. 1841, abstracted in Forbes' Med. Review, XIII, 1842, 539.

Groom, 30, constantly had dealings with glandered horses. Pain in throat, nose stuffed up and bloody discharge on blowing it, ulcer on hard palate, abscess of instep, acute glanders. Four years. Died. Trachea one vast cicatrix.

(36)—**Tardieu's** 2nd case. Reported to Acad. de Méd. Royale, March 8, 1842, abstr. in Dublin Med. Press, VII, 1842, 232.

Veterinary surgeon's assistant dressed ulcer for glandered horse Multiple relapsing abscesses, diarrhœa, emaciation. Supposed cure, relapse. Over twenty-six months. Died. Nasal ulceration and perforation of septum, pulmonary ecchymoses and metastatic abscesses, pus in right wrist and left ankle joints.

Note nasal ulceration and perforation of septum, though no purulent discharge was present during life.

(38)—**Monneret's** 1st case. Gaz. des Hôpitaux, abstr. in Lancet, 1842-43, I, 753.

Waggoner, 19, slept in stable with glandered horse. Malaise, intense pain in legs, pustules on instep, diffuse non-suppurative swellings, emaciation, phlegmon of left arm. Horse inoculated died in five days without clinical signs of glanders. Cinchona, iodine and potassium iodide internally. Nine and a half months. Definite cure, well two years later.

(39)—**Monneret's** 2nd case. Arch. Gén. de Méd., Oct. 1847, abstr. in Virchow's Archiv., 1867, XXXIX, 567.

Groom, received wound on hand while caring for glandered horse; abscesses of extremities and left testicle, nasal ulceration and perforation of septum, irregular fever; small abscesses in right antrum and liver.

(40)—**Lhommau** and **Rocher.** Gaz. des Hôpitaux, abstr. in Dublin Med. Press, VI, 1841, 324.

Groom, 41, often washed noses of glandered horses. 'Ague', abscesses, vomiting and diarrhœa, slight rigors, sweating, emaciation, jaundice, dysphagia, pharyngitis, bronchitis, dyspnœa; scanty pustular rash with slight gangrene. Horse inoculated died without characteristic symptoms. Local mercurial inunctions, quinine. Six months. Died. Ulceration of nares, right lower lung hepatized, left cong..., pus in pleural cavity, liver and spleen enlarged.

Rocher died of acute glanders contracted from this case.

(41)—**Krieg.** Thèse de Berlin, abstracted in London Med. Times, VII, 1842-43, 329.

Postilion, cared for glandered horse. Gastric attacks, multiple abscesses, sweating, pain in side, cough and dyspnœa, gangrenous boils, phlegmon of neck, general eruption of bullæ, nasal discharge. Seven months. Died.

(42)—**Comley** and **Hughes.** Guy's Hospital Reports, 2nd series, I, 119, and Dublin Med. Press, X, 1843, 24.

Horseflayer, 40, cut arm while skinning horse. Lymphangitis, rheumatic pains, jaundice, painful fluctuating swellings, cough, rales over right lung, pustular rash, serous discharge right eye, nasal discharge, sweating. Seven weeks. Died.

(43)—**Dezantières.** Reported to Société d'Emulation, quoted in London Med. Times, XIV, 1846, 304.

Veterinary surgeon, 50, wounded finger while operating on glandered horse. Wound infection, lymphangitis, abscesses in legs, left sided pneumonia, inflammation of right eye. Five months. Died. Incubation seven days.

Note that wound infection was purely local for eight days previous to onset of lymphangitis.

(44)—**Neumann.** Trier. Rheinische Monatsschrift, Aug. 1849, abstr. in Virchow's Archiv., XXXIX, 1867, 565.

Military physician had glandered horse sneeze in face. Despite energetic cleansing nasal and aural discharge, perforation of septum, hoarseness, septic manifestations. Two and a half years. Died.

(46)—**Anonymous.** Kr. Phys. Unfefug, Gerlach's Mitth. V, 10, abstr. by **Kuttner**, Virchow's Archiv., XXXIX, 1867, 569.

Horse owner examined manually lesions of a glandered horse. Suppurative lymphangitis, apparent recovery, abscesses of arms, chills, wild delirium. Three months. Supposed cure.

(47)—**Anonymous.** La Presse Médicale, abstr. in London Med. Gazette, XI, 1850, 315.

Man, 23, had charge of glandered horses. Nasal discharge and bony destruction, lacrymal fistulæ, deltoid abscess, fever, emaciation, diarrhœa. Potassium iodide useless. Over sixteen months. Died.

(48)—**Roll.** Wiener Ztschr., VII, 1850, abstracted in Virchow's Archiv., XXXIX, 1867, 569.

Veterinary student did autopsy on glandered horse, statedly with no abrasion. Swelling of hands, lymphangitis, phlegmon of face, nasal discharge and ulceration. Five months. Died. Incubation eight days, eight more days elapsed before lymphangitis developed.

(49)—**Ballard** and **Pritchard.** Lancet, 1850, I, 51.

Groom, 28, cared for glandered horses. Dyspepsia, phlegmon of upper face, later of foot, tumors, some suppurating, pustules on face, nasal discharge, pharyngitis, pustules on extremities, some on a white wheal; swelling of wrist, confluent blebs (? and gangrene) on shins. Four months. Died.

Note whitish œdema about some of pustules.

(51)—**Banks.** Dublin Quarterly Journ. of Med. Science, XIV, 1852, 87.

Groom, 36, scratched hand while dosing glandered horse. Rheumatic pains, multiple abscesses, jaundice, rigors; remission; phlegmon and gangrene of face, pharyngeal and nasal ulceration, pustules with white areola surrounding on back and shoulder. Eleven months. Died. Two splenic abscesses

Note white areola surrounding pustules.

(52)—**Stahl.** Munch. Deutsche Klinik, XXXV, 1852, abstr. in Virchow's Archiv., 1867, op. cit.

Shoemaker with abrasion of finger had care of glandered horse. Suppurative lymphangitis, a few abscesses elsewhere; relapse after apparent recovery, few nodules on face. Eleven months. Supposed cure.

(53)—**Ganzl.** L'Union 76, 1852, abstr. in Virchow's Archiv., XXXIX, 1867, 565.

Man touched his nasal mucosa after being sneezed on by glandered horse. Cervical adenitis, abscesses all over body; recurrence after apparent recovery; nasal discharge and ulceration, pleurisy, phlegmon of face. Eleven months. Died.

(54)—**Williams** and **Taylor.** Dublin Med. Press, XXVII, 1852, 212.

Hackney car man, 51, treated several glandered horses, injecting their nostrils. After healing of slight injury to skin a local rash appeared at once, cough, (pharyngeal) expectoration, nasal discharge, eyes suffused, pustular rash, phlegmon and slight gangrene of face. Seven months. Died. Autopsy showed that his horse had typical glanders.

Note development of initial rash, AFTER HEALING of the local injury.

(55)—**Decaisne** and **Hamoir's** 1st case. Arch. Belges de Médec. milit., quoted in Revue Méd.-Chirurg. de Paris, XII, 1852, 162.

Lancer, 25, dressed abscesses for glandered horses while chapped hands. Stubborn abscesses of left shoulder, asthenia, abscesses above elbows and behind cranial vertex. Potassium iodide useless, as was quinine, iron and tinct. iodine. Great improvement followed aconite in large doses. Two and a half ears. Incomplete. Returned to work among diseased horses with head abscess discharging.

Note that first lesion mentioned was the only one for many months.

(56)—**Decaisne** and **Hamoir's** 2nd case. Ibid.

Lancer, 24, worked among glandered horses. Lassitude, hoarseness, abscesses of all extremities. Marked improvement under aconite, worse when it was stopped and again improved when resumed; headache, epistaxis and fatal typhoid-like attack. Potassium iodide useless. Six and a half months. Died. Tracheal ulcers; autopsy not fully reported.

Death was considered due to typhoid, but it is very douhtful whether typhoid was present. These two cases make a fairly good showing for aconite.

(57)—**Mackenzie.** Med. Times Gazette, London, V, 1852, 7.

Stableman, 47, scratched finger while dosing glandered horse. Wound infection, suppurative lymphangitis, obstinate phlegmon and some gangrene of left foot, rigors, indigestion, typhoidal state, pustules on face and shoulder, walnut-sized suppurating tumors. Over four months. Supposed cure.

Blue pill, Fowler's solution and amm. carb. were credited with favourable result. Mackenzie also reports an acute case treated with am. carb. with successful result. Incubation a few hours.

(58)—**De la Garde** and **Clapp.** Med. Times Gazette, N. S. VII, 1853, 539.

Man did autopsy on glandered horse while a sore on finger was present. Wound infection, multiple abscesses, suppuration of knee-joint, cough, night sweats. Thirteen months. Incomplete. Incubation 48 hours.

(59)—**Hauff.** Kircheim Thesis, 1855, Die Rotzkrankheit beim Menschen, abstr. in Virchow's Archiv., XXXIX, 1867, 567.

Butcher had nasal secretion of glandered horse run over abrasion of thumb. Rigor, wound infection, lymphangitis, axillary adenitis, ulceration of lips, multiple abscesses. Nineteen months. Supposed cure. (? Incubation 24 hours).

(61)—**Carpenter.** Med. Times Gazette, 1855, II, 110.

Grazier, cared for glandered horse while lacerated wound of lip. Wound infection, phlegmon of face, multiple abscesses, bronchitis, transient conjunctivitis, rigors, general pustular rash, nasal discharge; improvement. Ung. hydrarg., quinine, citric acid, arg. nit. to nose. Three and a half months. Incomplete.

Note attack of acute glanders followed by improvement.

(62)—**Cazin.** Lancet, 1856, I, 633.

Liveryman, 38, scratched thumb while cleaning out glandered stable. Rigors, abscesses of extremities. Quinine, ung. hydrarg., potassium iodide, large doses of aconite. Fourteen months. Probable cure, well 5 months later.

Gain attributed to aconite, probably improvement in hygienic conditions and antiseptic measures adopted were important in attaining this result.

(65)—**Bourdon.** Reported at Acad. de Médecine, meeting of Dec. 1, 1857, quoted from Rémy, op. cit., or Archiv. Gén. de Méd., 5th S., XI, 1858, 101.

Uncleanly groom, origin of disease not stated. Pains in limbs, multiple abscesses, nasal discharge. Horse inoculated died; glanders in it denied. Duration not stated. Definite cure, well 18 months later.

(67)—**Buntzen.** Hospitals Tidende, No. 14, 1860, quoted by Kuttner, Virchow's Archiv., XXXIX, 1867, 566.

Man cared for glandered horse while abrasion on cheek. Multiple abscesses, diplopia, phlegmon of hands; nodules on face, nasal discharge, ulceration and bony destruction, general pemphigus. Four months, Died.

(71)—**Lesur.** Gaz. des Hôpitaux, abstr. in American Med. Times, V, 1861, 260.

Farmer, had dealings with glandered horses. Chronic glanders with multiple abscesses. Calomel, cauterization with ac. nitrate of mercury. Duration not stated Definite cure, well twelve years later.

Patient's father who also was infected died of acute glanders.

(72)—**Savory** and **Marsh.** Med. Times Gazette, XXVI, 1863, 161.

Stableland, 52, had charge of glandered horses. Nasal discharge, adenitis, suppurating farcy buds, conjunctivitis. Potassium iodide of benefit. Six months. Supposed cure.

(74)—**Johnson** and **Kelly** Med. Times Gazette, 1865, I, 441.

Groom, 42, had charge of glandered horses. Joint pains, transient nasal discharge, rigors, pus foci in joints and elsewhere, emaciation, erysipelas of wrists. Condy's fluid for nose, quinine, iron. Seven weeks. Died. Tubercular masses, not softened, in lungs.

(75)—**Sommerbrodt.** Virchow's Archiv., XXXI, 1864, 463.

Horse flayer, 23, had special dealings with glandered horses. Attacks of weakness, pain and tenderness over liver, rigors, icterus, bronchitis, pustules on chest and hand, nasal ulceration, pharyngitis, phlegmon of penis, discharge from under prepuce, vomiting and diarrhœa. Twelve months. Died. Subpleural yellow nodules in hyperæmic areas, nodules in bronchial glands, obstruction of left hepatic duct by debris from liver abscess, thrombosis of left branch of portal vein and pyæmic liver abscesses, spleen enlarged.

Note very unusual involvement of penis and jaundice due to obstruction of left hepatic duct.

(77)—**Kuttner's** 1st case. Virchow's Archiv., XXXIX, 1867, 548, case begins 556.

Female cook, 24, contact with glanders unknown. Chill, phlegmon of right foot, lymphangitis of right thigh, general ecthyma, delirium, exophthalmos, muscular abscesses, necrosis of jaw, nasal mucosa affected. Six weeks. Died. Basal extradural purulent meningitis of frontal lobe, also of interpeduncular space, (superficial) pea-sized nodules in lungs.

(78)—**Kuttner's** 2nd case. Ibid.

Coachman, 37, worked barefoot among glandered horses. Chills, swelling and ulceration of foot and leg, chronic diarrhœa, periostitis of left tibia, phlegmon of left face and two small-pox-like pustules, nasal discharge, ulcer of palate with bone necrosis, phlegmon with slight gangrene and pemphigus over left shoulder. Seven and a half months. Died. Small superficial nodules in injected lungs und pleura.

Note probable infection through bare feet.

(79)—**Harrison.** Lancet, 1872, II, 910.

Blacksmith, 43, dressed abscess of glandered horse. Pharyngitis and tonsillitis with dysphagia, parotid and submaxillary adenitis; phlegmon of face. gluey nasal discharge, phlegmon of foot, submaxillary abscesses. Cinchona, ammonia. Six weeks. Incomplete.

(80)—**Smith** and **Cripps.** Lancet, 1874, I, 545.

Groom, 36, caring for glandered horses, had one breathe in his face. Rigors, joint pains, jaundice, abscesses on occiput and legs, diarrhœa, pneumonia, phlegmon of leg with slight gangrene. Potassium iodide, quinine. Three months. Died. Broncho-pneumonia, thrombosis of femoral vein.

(81)—**Walton** and **Coumbe.** Med. Times Gazette, 1877, II, 13.

Horse-dealer, in poor health, contact with glanders not stated. Generalized bullæ with underlying ulcers, purulent conjunctival and nasal discharge, bronchitis and left pneumonia. Iodide of iron, chlorine solution to mouth and nose. Six weeks. Supposed cure.

Nurse had fever and sloughing of tonsils, supposedly contracted from this patient.

(82)—**Dickinson** and **Owen.** Lancet, 1887, II, 461.

Stableman, 26, subject to winter cough, was in contact with glandered horses. Rigors, sweating, abscesses, pustular rash on forehead, diarrhœa. Thermocautery,

potassium iodide, spirits of ammonia arom., cinchona. Six weeks. Died. Osteomyelitis of right femur, a few superficial pea-sized pulmonary nodules.

Note the osteomyelitis.

(83)—**Shearer.** Lancet, 1877, II, 789.

Carter, 18, admitted as syphilitic, thought cut on hand had been infected by dressing abscess for horse. Pustules along wound, then all over body, sore throat, hoarseness, phlegmon of feet and arms, sight lost from eye involvement, glairy fluid hawked up, gangrene about neck. Three months. Died.

For three weeks after patient's death his mother had bucal congestion, salivation and irregular heart. Recovered with pot. chlor. gargle and tonic.

(84)—**Scheby-Buch.** Berliner klin. Woch., Feb. 11, 1878, abstr. in London Med. Record, VI, 1878, 115.

Man, 31, had dealings with glandered horse. Chill, abscesses on neck and wrist, hoarseness, ocular discharge, pustular rash, ulcers on tongue, pustules on nasal mucosa, delirium. Cat inoculated—negative. Three months. Died.

(86)—**Lombardo.** Giorn. di medic. militare, 1881, 1082, abstr. in Jahresb. d. gesammte Med., 1883, I, 589.

Artilleryman, worked in glandered stable. Pleurisy, abscesses, phlegmon over jaw, pimples leading to serpiginous ulceration. Four months. Died.

(87)—**Auer's** 1st case. Friedreich's Blatter, 1884, S 3, abstracted in Jahresb. d. gesammte Med., 1884, I, 607.

Stallknecht, 58, allowed glandered horses under his care to lick him. Several months after their death pustular eruption on place habitually scratched. Suppurative lymphangitis, joint pains, plantar abscess, caries of tarsus. Inoculation of sheep and rabbits—negative. Fifteen months. Died.

Note supposed incubation of several months, really an indefinite onset followed by latency.

(88)—**Auer's** 2nd case. Ibid.

Wife of (87), infected per vaginam. Vaginitis, pains and abscesses in extremities, suppurative cervical, axillary and inguinal adenitis; severe delirium. Twenty-two months. Died. Nodules in peritoneum, walnut sized nodule in right cerebral hemisphere.

Note manner in which disease was contracted from husband.

(89)—**Kelp.** Friedreich's Blatter, 1884, S. 120, abstracted in Jahresb. d. gesammte Med., 1884, I, 607.

Countryman, cared for glandered horse; carbuncle between nose and eyes, painful swellings, mainly non-suppurative, in limbs; phagedænic ulceration about ankle, phlegmon of nose. Eight months. Died.

(92)—**MacCormack, Ballance** and **Sharkey.** Lancet, 1885, II, 200.

Cabman, subject to winter cough and attacks of rheumatism, lost horses from glanders. Offensive nasal discharge, ulcer of palate (soft) and offensive phlegm expectorated; severe pains hip to knee, abscess of thigh, rigor, delirium, general papulo-pustular rash, dyspnœa, tympanites. Bacilli shaped like tubercle bacilli in pustules. Quinine. Twelve months. Died. Tracheal ulcer, caseous nodules in congested areas, liver and spleen large.

(93)—**Garstang's** 1st case. Lancet, 1885, II, 755.

Farmer, 36, had secretion from glandered horse fall on unabraded arm, wiping it off with wisp of grass. Next day local eruption of small red spots which suppurated and disappeared under precipitate ointment in two days, and no discomfort felt in arm. Tightness of chest, malaise, mucus hawked from posterior nares, loss of weight, fever, jaundice, liver large and tender, nasal discharge, diarrhœa (? pus from liver), farcy buds, phlegmon of face. Quinine, arsenic, mercuric chloride internally. Seven weeks. Died.

Note local onset (pustules), with none of usual local phenomena, such as lymphangitis or adenitis; probably a slight abrasion was produced by the grass used to wipe off discharge.

(94)—**Cooper.** Journ. American Med. Assoc., IX, 1887, 110.

Housewife infected (? per vaginam) by husband fatally ill with acute glanders contracted from a horse. Vaginitis, multiple abscesses. Improvement and relapse. Necrosis of bony palate, phlegmon of face, involvement of one eye, facial paralysis, swelling of joints, partly suppurative. Rallied when moribund, hoarseness. Quinine, iron, mercury, iodides, argent. nit. to throat, good hygiene. Twenty-eight months. Probable cure. Incubation under 21 days.

P[illegible] infection per vaginam. A remarkable instance of recovery after being apparently moribund.

(98)—**Seanezkji.** Med. Obosrenie, abstr. In British Med. Journ., 1888, I, 1285.

Soldier, formerly waggoner, contact with glanders not stated. Perforation of hard palate, destruction of inferior turbinated bones, left otitis media, abscess of hand, farcy buds on face. Glanders-like bacilli in some foci. Potassium iodide useless. Duration not stated—some months. Died.

(99)—**Churton.** British Med. Journ., 1888, II, 181.

Ironstriker, 21, acting as groom, contact with glanders not stated. Rigor, typhoid-like attack, numerous non-suppurating nodules, phlegmon of left cheek, left conjunctivitis, melæna, broncho-pneumonia, albuminuria. Five and a half months. Died. Nodules in stomach, bowel, lungs (superficial) and kidneys. Spleen enlarged, Peyer's patches normal, many nodules in colon ulcerated.

Note unusual presence of specific lesions in stomach, bowel and kidneys.

(110)—**Collie.** Lancet, 1892, II, 719.

Man, 25, dosed glandered horses, being often bitten in doing so. Cough, emaciation, rigor, delirium, bloody sputum, pneumonia, pharyngitis, papulo-pustular eruption on chest and limbs, discharge from nose and right eye, abscesses in calves and right shoulder, erythema over joints. Three months. Died. Recent pleural adhesions, mixture of lobular pneumonia and pulmonary apoplexy, large infarct of spleen, several extradural collections of pus, solid viscera 'rotten'.

(114)—**Borrero.** Revista de Ciencias Médicas, Havana, May 30, 1892, abstr. in International Med. Magazine, II, 1893, 103.

Blacksmith's assistant, contact with glanders not stated. Multiple abscesses of extremities, joint inflammations, marasmus. Potassium iodide, mercurial inunctions, vaselin with calomel to sores. Several months. Supposed cure.

(116)—**Finzi.** London Veterinary Record, Oct. 20th, 1894, 237.

Cabman, 53, lacerated thumb wound from kick of glandered horse refused to heal. Fever, nodules and abscesses in extremities; pustular rash on face, scalp and limbs, delirium, vomiting and diarrhœa. Over six weeks. Died. Lungs thickly studded with deposits.

(122)—**Garstang's** 2nd case. Lancet, 1895, I, 673.

Veterinary surgeon, 54, had glandered horse cough over his face and arm. Arm uncomfortable and felt ill in a few hours, pustular rash on arm a week later; later general rash, asthenia, discharge from nose and eyes, phlegmon of legs; purulent expectoration negative (? for tubercle bacilli) bacteriologically. Iron, quinine, Condy's fluid to nose. Two months. Incomplete.

Subjective symptoms within a few hours of contact with [illegible] discharge, which was not washed off, though local rash appeared only a week later.

(123)—**Gordon** and **Sharpe.** Lancet, 1895, II, 404.

Horse-shoer, 23, contact with glanders not stated. Foul, watery discharge from left nostril, then from left eye, gangrene of face, destruction of eye, involvement of face bones. Numerous bacilli resembling tubercle bacilli in discharges. Scraping and cauterizing nose and tonics useless, removal of jaw and eye. Fifteen months. Died.

Note extensive gangrenous involvement, disease apparently confined to the head.

GROUP C

Cases the available records of which are imperfect but regarded as glanders and used for statistical purposes—19 cases.

(7)—**Hertwig.** Med. Zeitung von Preussen, abstr. in Archiv. de Méd. Expér. IX, 1897, 165.

Veterinary Surgeon had glandered horse sneeze in his face; swelling of left cheek and submaxillary gland, discharge from left nostril. Duration not stated. Supposed cure.

(15)—**Vogell's** 1st case. Veterinarian, Apr. 1835, abstr. in Amer. Journ. Med. Sciences, XVI, 1835, 473.

Veterinary student pricked hand while operating on farcied horse. Lymphangitis in a few hours despite immediate cleansing, suppurative axillary adenitis. Nearly twelve months. Supposed cure. Incubation a few hours.

16)—**Vogell's 2nd case.** Ibid.

Veterinary student, 21, pricked palm. Wound infection, lymphangitis of arm, ulcers on knee, lips and fauces. Nine months. Died.

(17)—**Vogell's 3rd case.** Ibid.

Veterinary student inoculated himself dissecting farcied horse. Stubborn lymphangitis; final supposed cure as in (15). Duration not stated.

(18)—**Vogell's 4th case.** Ibid.

Veterinary student wounded right index finger while operating on farcied horse. Wound infection, lymphangitis. Six months in hospital. Wound still unhealed after three years. Three years. Incomplete.

(21)—**Kratzenstein.** Reports of Board of Health for Province of Pomerania, published in 1845, quoted by Eck, op. cit.

Laborer, 46, injured hand gathering up provender after strange horse. Fever, swelling of right hand with pus foci, abscess of left arm, suppuration of right wrist and right ankle joints with bony involvement. Cinchona. Eight weeks. Died.

(29)—**Alexander's 3rd case.** Hufeland & Osann's Journal, 1835, B. 2, h. 2, abstr. in Forbes' British and Foreign Med. Review, II, 241.

Artilleryman cleaned glandered horse. Pustular foci in forearm, leaving spreading ulcer which only healed after thirteen months.

(37)—**Ludiche.** Med. Ztg. von Preussen, 1842, or Journ. des Connaissances Méd. Chir., March 1843, abstr. in Lancet, 1842-43, II, 312.

Coachman, 53, cured for glandered horse. Pain in right arm, hoarseness, cough, non-suppurating swellings on hands, burning pains in face and hands after exposure to cold and papulo-vesicular rash there eight days later, dysphagia and sore throat, emaciation. After four months apparent cure, recurrence of rash after exposure. Mercurial inunctions useless; potassium iodide, tr. iodine to foci. Duration (?) ten months. Incomplete.

Note apparent influence of cold in determining development of lesions.

(59)—**Marée** and **Verheyen.** Bull. de l'Acad. de Méd. de Belgique, 1855, 148, quoted by Rémy, op. cit.

Horseflayer pricked thumb skinning horse. Wound infection, lymphangitis, multiple abscesses of that arm. Calomel and red precipitate. Six weeks. Supposed cure.

(63)—**Patellani.** Giorn. di Vet., quoted by Kuttner, Virchow's Archiv., XXXIX, 1867, 568.

Man had charge of glandered horse, inoculated wound of finger. "Languished typically." Over six months. Supposed cure.

(64)—**Anonymous.** Journ. de Méd. Véterinaire, 1857, quoted by Kuttner, op. cit.

Groom, developed wound infection. Suppurative lymphangitis, 'typical symptoms', finally nasal discharge. Four and a half years. Died.

This statement as to (63) and (64) was made by Kuttner, who was familiar with human glanders.

(66)—**Paradi.** Il Veterinario, Aug.-Dec., 1858, quoted by Kuttner, op. cit.

Coachman, cared for glandered horse. Painful swelling of right hand, abscesses all over body. Long duration, not stated. Supposed cure.

(68)—**Anonymous.** L'Union Médicale, 1861, No. 74, quoted by Kuttner, op. cit.

Coachman, 'inoculated himself with glanders'. Callous ulcer of hand, multiple abscesses. Five months. Supposed cure.

(69)—**Bertin** and **Cazin.** L'Union Médicale, 1861, No. 112, quoted by Rémy, op. cit.

Gardner acting as groom. Pain in side and abscesses. Potassium iodide, large doses of aconite. Nineteen months. Definite cure, well three years later.

Rémy, familiar with human glanders, says the description leaves no doubt.

(70)—**Virchow,** quoted by Fagge, article on Glanders in Fagge's System.

Man. Refractory ulcers on legs. Six months. Died. Typical glanders lesions (Virchow's statement) at autopsy. Inquiry led to discovery of epidemic of glanders among canal horses.

(73)—**Bollinger.** Ziemssen's Cyclopædia of the Practice of Medicine, article 'Glanders'.

Veterinary surgeon after having glanders eleven years was still cachectic and had cough, mainly owing to cicatrices in nose and larynx.

(91)—**Welply.** Lancet, 1885, I, 1017.

Chronic infection from glandered horse through upper lip, submaxillary and cervical, then general adenitis. Death from pyæmia.

(148)—**Straka.** Wien. Med. Woch., 1901, 607, abstr. in Baumgarten's Jahrb., year XVIII, for 1902, 321.

Groom, developed chronic glanders. Multiple muscular abscesses. Duration not stated. Supposed cure. (Baumgarten regards the cure as doubtful). Mallein

(156)—**Anonymous Canadian Case** occurring in 1885, private communication to the writer.

Man had dealings with glandered horses; multiple abscesses and nasal discharge; 3 months, died. Not diagnosed glanders, but the nature of the malady seems fairly clear.

GROUP D

Cases reported as chronic glanders but considered too doubtful or too meagre to be included for purposes of analysis—15 cases.

(1)—**Alexander's** 4th case, op. cit.

Case of glanders lasting two months. Supposed cure.

(2)—**Bouley.** Prieur, Thèse de Paris, 1808, or Rémy op. cit.

Refers to case of Denonville, a Belgian veterinary surgeon, who had chronic glanders about the same time as he himself was affected and finally recovered.

(3)—**Anonymous.** Archiv. Gén. de Méd., XXVII, 1851, 424.

Gressent refers to a case of chronic farcy cured and remaining well a year later.

(4)—**Parola.** Ibid.

Case of chronic fatal farcy.

(5)—**Gressent.** Ibid.

Case of chronic farcy ending in acute glanders.

(6)—**Levy.** London Med. Gazette, 1851, 345.

Groom, 26, dressed ulcer on horse's foot. Intermittent fever, swelling of nape of neck, rigors, violet nodules on extremities, trunk and face (disappeared), cough and pain in left chest, vomiting, diarrhœa, cervical, axillary and inguinal adenitis, tumors of thigh, bloody stools. Fourteen months. Died. Necrosis of both femurs, osteomyelitis of right humerus, pus in right sterno-clavicular joint extravasated blood in posterior parts of lungs, congestion of lower small bowel with deep ulcerations near ileo-cæcal valve.

(7)—**Zimmermann's** first case. Virchow's Archiv., XXIII, 1862, 311.

Veterinary surgeon, 29, treated his glandered horse. Ordinary febrile symptoms, face inflamed, copious diarrhœa, bronchitis and tough rusty sputum, thick bloody nasal discharge. Relapse after convalescence and roseolar spots on chest, blood and pus in stools (? rectal abscess), albuminuria, rigors, sweating, œdema (? phlegmonous) of legs. Convalescence, cardiac weakness, hydrocele requiring puncture, great dilatation of veins of abdominal wall; had to be invalided. Duration (?) seven months. Result indefinite.

(8)—**Zimmermann's** 2nd case. Ibid.

Cuirassier, looked after glandered horse mentioned in (7). Six weeks after its death, chill, abdominal and general pain and diarrhœa, bronchitis, dyspnœa, phlegmon of face, copious painful diarrhœa, albuminuria, roseolar spots, bloody stools. Gradual gain, bloodshot conjunctivæ. Over two months. Supposed cure.

(9)—**Zimmermann's** 3rd case. Ibid.

Cuirassier had febrile symptoms, cough, bronchitis, delirium, phlegmon of face, roseolar spots on back, emaciation, casts in urine, sacral phlegmon In bed three weeks. Left hospital in two and a third months.

(10)—**Zimmermann's** 4th case. Ibid.

Cuirassier, 22, was in hospital three weeks in same room that all three former cases had occupied. Two weeks after leaving it general malaise, chills later, and vomiting, phlegmon of face, bronchitis later, dulness of right base, phlegmon over sacrum, later small abscesses there, hoarseness, emaciation, repeated chills, nose bleed, acute nephritis. Two and a half months. Cure.

All Zimmermann's cases may have been typhoid. Kuttner (op. cit.) is of this opinion.

(11)—**Anonymous.** Lancet, 1872, II, 233, states that the Georgia Medical Companion reports a case of glanders in man cured by phenol internally.

(12)—**Burroughs.** Lancet, 1872, II, 938.

Blacksmith had dealings with a horse that had 'influenza'. Fever, salivation, thick fœtid nasal discharge, depression and restlessness. Supposed recovery after a severe course

(13)—**MacNaught**, in report to General Prison Board for Scotland for 1880 refers to a prisoner who worked with a glandered horse before being committed and had then been six months in the prison hospital with farcy. He was gradually failing.

(14)—**Babès's** 4th case. Archives de Médecine Expérimentale, 1891, 641.

Man, 60, died after three days in hospital; no history obtained. Phlegmon of left side and right arm, pleurisy and swelling of left shoulder, abscess in right pectoralis major, pulmonary nodules, pleural adhesions, peripheral pulmonary nodules, softened centrally, in congested areas. B. Mallei and streptococci. Field mice—positive.

Here it is only the chronic nature of the disease that is in doubt. From the absence of ulceration of skin and nose, Babès supposes the case to have been chronic.

(15)—**Widal,** from Zieler, Zeitschr. f. Hygiene, 1903, XLV, 324.

A case of acute glanders following chronic farcy (Archiv. de Méd. et de Pharmacie Militaire). In the long swollen and painful knee and ankle were found increase of clear synovia and injection of the synovial membrane, but no infiltration; no metastases; no bacterial investigation.

GROUP E

Cases of chronic glanders inaccessible to the writer.—This list is very incomplete, since in most cases it is only after reading through the case report that it is possible to decide whether a given case was acute or chronic.

Baraduc—Bull. Acad. de Méd., Paris, 1841-42, VII, 338.
Beizy—Comptes rend. Soc. de Sc. Méd. de Gaunat, 1863, ,XVII, 105.
Bréant—Rec. de Mém. de Méd Milit., Paris, 1856, 2S., XVIII, 279.
Cabasse—Ibid., 273.
Chvostek—Allg. Wien. Med. Zeitung, 1874, XIX, 430.
Colin—Bull. Acad. de Méd., 1870, 2 S., VI, 467.
Costilhes—Bull. Soc. Anat. de Paris, 1840, XV, 243.
Demarquay and Dufour—Gaz. Hebd. de Méd., Paris, 1856, III, 627.
Dubarry—Union Méd., Paris, 1864, 2 S., XXI, 594.
Genouville—Bull. Soc. Anat. de Paris, 1853, XXVIII, 141.
Gonzée—Ann. Méd.-Lég. Belges, 1843, II, 53.
Hairion—Archiv. de Méd. Milit., Brux., 1849, IV, 28.
Hermant—Arch. Méd. Belges, 1893, 4 S., II, 226.
Krieg—Med. Zeitung, Berl., 1843, XII, 23 (two or three chronic cases, only one of which is found in present series).
Morrison—San Francisco Med. Press, 1860, I, 101.
Perroud—Mém. et Comptes rend. Soc. Méd. de Lyon, IV, 1864, 353, also, Journ. de Méd. de Lyon, III, 1865, 436.
Petit—Bull. Méd. du Nord, Lille, 2 S., IV, 1863, 389 and 498; Ibid., 2 S., V, 1864, 17.
Potain—Bull. et Mém. Soc. Méd. d. Hôpit. de Paris, 2 S., XII, 1876, 314, or Union Méd., 3 S., XXI, 1876, 269.
Poulet—Carcom Méd., Paris, 1882, VII, 73 and 87.
Rayer—Bull. Acad. de Méd., Paris, 1841-42, VII, 240.

CHRONIC GLANDERS IN MAN.

Historical. Glanders has been recognized as a common disease among the equidæ for many centuries. Aristotle and Hippocrates mention glanders and farcy in the ass. Solleysel in 1682 reaffirmed the ancient doctrine of contagion and the relation between glanders and farcy, and still, over 150 years later the doctrine of contagion was not generally accepted. Viborg in 1797 proved the contagious nature of the disorder by numerous experiments. He also showed that drying or heating destroyed the contagion, and recommended hot water as a means of disinfecting glandered stables. In spite of these and other clear proofs, in France glanders was generally considered a spontaneous disease, and no measures were taken to prevent its spread among the horses of the French army till 1854*.

Knowledge of glanders as a human disease is not yet a century old. Van Helmont, Ricord and Beau regarded glanders in the horse and syphilis in man as identical, and in this light doubtless some cases of human glanders were considered. According to Rayer the first hint of the transmissibility of glanders to man is given by Waldinger, who in 1810 pointed out that inoculation of pus from glandered animals to man may cause death. However, Osiander in 1783 and Delabère-Blaine in 1803 had previously noted similar occurrences. Schilling's case, which is included in the present series, is generally regarded as the first case of unmistakable human glanders published (1821). Weiss's case, also synopsized in our series, and that of Museroft, an acute case that occurred in Great Britain and was definitely diagnosed as glanders, immediately followed. One of Travers's British cases occurred in 18[illegible] was not published till later (1826). Unfortunately Travers and [illegible]n, who investigated this case and reproduced typical fatal gl[illegible] a donkey by inoculating the animal with pus from the human case, failed to realize the true significance of their important experiments, and regarded this and their other human cases as the result merely of cadaverie poisoning.

The Edinburgh Medical and Surgical Journal for January 1823 contained an anonymous letter from London referring to a recent fatal case of farcy in a veterinary surgeon contracted from a farcied horse, and stating that the matter from a sore arm resulting from the contact of a wound with the leg of a farcied horse had recently been inoculated into a donkey, producing in the latter symptoms of glanders and ulceration of the nasal septum. Andrew Brown, in the Medical Gazette, July 1829, p[illegible]hed a marked case in which contact with a glandered horse was followed by a pustular rash on the skin which tended to become gangrenous, the formation of tumors about the

*The contagious nature of glanders in horses seems to have been popularly recognized in Great Britain nearly quarter of a century earlier than this. Scott in "St. Ronan's Well", last page of chap. 36, makes the hostler say: "'There's nae post cattle come into our stables. What do we ken but that they may be glandered?'. . . . 'We must TAKE THE RISK, tonight, Patrick', said Mowbray, reluctantly enough."

joints, ulceration of the right nostril with gummy discharge, and multiple subcutaneous and muscular abscesses. Grub and Krieg in 1829 (Thèses de Berlin) also pointed out two human cases. Important as these cases were, they attracted little attention. However, it was the report of Brown's case that cleared up for Elliotson the nature of two cases that had recently occurred in his practice. He collected other cases which were published in Medico-Chirurgical Transactions, June 1830, with a later communication in the same publication in 1833.

Rayer frankly admitted that to Elliotson's publication he owed his first idea of the human disease. In 1837 Rayer had an acute case which was most thoroughly studied. Pus from the human lesions was inoculated into a horse and the disease reproduced. Rayer gathered together all the literature on the subject, and brought forward incontestable proof of the contagious nature and inoculability of glanders in his remarkable monograph, which Osler over 50 years later characterized as still one of the best descriptions ever given of the disease.

Virchow's studies (1854-63) led him to consider the disease as an infective granuloma due to an irritant agent.

Chauveau in 1868 proved that the solid particles in the discharges were the source of contagion. Zurn and Hallier found a 'fungus' in the lesions of chronic glanders, which they thought identical with that found in syphilitic lesions. Later Babès described bacilli found by him in the lesions of a man dead of glanders.

In 1882 Loeffler and Schutz isolated the bacilli and cultivated them, as did Bouchard, Capitain and Charrin, working independently. In a second communication (1886) Loeffler dealt with the liability of different species to infection, with the staining reactions and cultural methods applicable to the bacillus and its resistance to various agents.

In 1886 Straus showed that intraperitoneal inoculation of the male guinea-pig produced a swelling of the testicles, which was practically pathognomonic of glanders. In 1890-91 Helman and Kalning, two Russian veterinarians, found that sterilized cultures of the bacillus mallei contained a substance, called by them Mallein, which when injected into diseased animals caused a reaction that was pathognomonic.

Since 1896 the attempt has been made by McFadyean, in England, Wladimiroff in Russia, and others, to apply the Widal method of serum diagnosis to glanders, with partial success.

Etiology. DEALINGS WITH HORSES THE MOST IMPORTANT FACTOR. Except when inoculated experimentally, glanders is a disease that among the lower animals affects practically only donkeys, mules and horses. The donkey is the most susceptible of these animals and the mule is less resistant than the horse. Now the bacillus mallei has little vitality; a temperature of 50-55° C. is fatal to it; it cannot resist dessication, and even under the most favourable circumstances it soon dies outside the animal body. Owing to this feeble vitality of the germ, glanders can hardly be contracted without an intimate relation with the disease. So it is clear that the local prevalence of human glanders in any place will stand in the closest possible relation to the prevalence of equine glanders in that place, and also, it may be added,

to the cleanliness of the people's habits and the precautions taken to avoid infection.

A very striking example of the truth of this statement is afforded by Cuba. Glanders was unknown there prior to 1872, when the disease was introduced, it is stated, by horses imported from the United States. Ignorant of the contagious nature of the disease and careless in hygienic matters as the people were, human glanders s on appeared and 18 fatal cases of glanders in man had occurred by 1874. From 1888 to 1893 there were in Havana alone the appalling number of 89 cases of human glanders, the nature of which was proved by bacteriological investigation. Davalos goes so far as to make the extraordinary statement that more cases of human glanders have occurred in Havana since the disease was introduced there than in all the great capitals of the world combined.

To continue our subject, so constant is this relationship between equine and human glanders that the latter may for practical purposes be considered as almost exclusively an occupation disease, affecting pre-eminently those who have habitual intimate relationships with the equidæ. This fact is well illustrated by a consideration of the occupations followed by the 156 cases comprising the present series. Indeed, in many of these cases it was a knowledge of the patient's occupation that first led the way to a correct diagnosis. Where a man had more than one occupation, or where occupation is not stated but the man had the care of horses, for the purposes of this analysis his occupation is considered to be that which brought him into relationship with horses.

15 times the occupation is not mentioned and 5 of the cases were children; 43 grooms; 18 coachmen, carters or postilions; 17 veterinary surgeons or students; 12 soldiers; 8 farmers; 6 horse-flayers; 6 blacksmiths; 5 physicians; 5 housewives; 4 countrymen; 3 liverymen; 3 horse-owners; 2 pathological assistants; 1 horse-dealer; 1 painter; 1 butcher; 1 cook-girl.

The existence of glanders among the horses with which the patient has had dealings may usually be demonstrated by careful investigation, as is seen by an examination of our present series, in which 99 of 156 cases (63.5 %) are stated to have come into contact with glandered animals (horses 98 times, donkey once). In 7 other cases (4.5 %) there was contact with horses that were glandered, but were not recognized as such. In 4 of these cases horse-flayers infected wounds while at their work, and twice horses with abscess of the thigh infected those who dressed them. Once a blacksmith is noted to have contracted the disease by sleeping with a horse that died of fœtid diarrhœa. In three additional cases (2%) previous contact with glandered horses was admitted, but this contact had ceased from one to twelve years before the apparent onset of the human disease. These last interesting cases will be considered later under the heading of Latent Glanders.

In 12 of the 156 cases (8%) the source of infection when carefully inquired into remained unknown, and in 25 others (16%) it is not stated, but it is worthy of note that the majority even of these 37 cases had habitual dealings with horses, and in very few cases is it

indeed stated definitely that the patient had had nothing to do with horses.

Before passing on to consider other modes of infection, it is perhaps worth while to notice briefly the way in which the disease is usually communicated from horses to men, as shown by these 156 cases. In 44 cases (27%) it would appear that the ordinary care of, or ordinary contact with a glandered horse was sufficient to communicate the disease. Indeed, it is not always necessary to come in direct contact with the animals, as is evidenced by the case of a child of three years who was infected by playing in a smithy where glandered horses had been. In 27 cases (17%) the contact with diseased animals was of a special character, though there was no wound present; e. g. farcied horses were being treated, having their abscesses dressed, or being given special care in 11 cases. In 6 cases the glandered horse sneezed or coughed in the patient's face; three times the patient slept in the stable with the glandered animals. and once the diseased horse was kept in the patient's dwelling*; once the patient made a careful manual examination of the horse's lesions; once he allowed the diseased animal to lick him; once the patient kept his bread in the diseased horse's manger; once a horse-skinner had specially to do with farcied horses; once a wisp of grass was used to wipe glanderous discharge from the patient's unabraded arm; and once the disease followed an autopsy on a glandered horse, the hands and arms being said to have no abrasion.

Of the 105 cases of definitely equine origin, a wound or abrasion was said to be present in 40— 37 times on the hand or arm, twice on the face and once on the lower extremity. Five times (3%) the wound was received or infected while operating on a farcied horse; 11 times (7%) while dissecting or skinning a glandered animal. Though in many cases contact with the glandered animal is prolonged for several years before infection occurs, in other instances a single examination of the glandered animal is sufficient to cause the disease.†

The presence among the horses of nasal discharge, submaxillary enlargement or farcy buds should always be inquired into and if any of these symptoms are present the animals should be tested with mallein to make the diagnosis certain. Horses with chronic glanders are more apt to infect man than are acute cases, for the prolonged contact with the disease and the frequency with which it is regarded as a trifling ailment more than offset the greater virulence of the acute form. It has been noticed that glanders has become rare in man just in proportion as rigorous measures are adopted to stamp out the disease in animals. In a very rough way this is indicated by an exam-

---

*Keeping glandered horses in the dwellings seems to have been a not very uncommon source of infection in Ireland.

†Two Russian cases, though acute, may be mentioned here. (i) A gentleman who had never in his life had any thing to do with horses contracted glanders and the origin of the disease was obscure till it was found that a few days before the onset he had been sneezed on by a passing horse as he was crossing the street. (ii) A glandered horse touched with its nose the cheek of a lady who was stooping to pick up a bracelet dropped near the edge of the pavement and thus communicated the disease, which in this case began in the face.

ination of the approximate decennial occurence of the present series of cases, a case being considered to belong to that decennial period in which it began.

Cases previous to 1830	— 13	Cases from 1861 to 1870	— 10
" from 1831 to 1840	— 18	" " 1871 to 1880	— 7
" " 1841 to 1850	— 19	" " 1881 to 1890	— 27
" " 1851 to 1860	— 17	" " 1891 to 1900	— 35
Cases from 1901 to 1905*	— 10		

We find that the decennial periods from 1881 to 1900 contain absolutely more cases than any previous similar period, but when we take into consideration the increase of population, the more accurate methods of diagnosis available in recent years, the greater facilities for reporting cases that have obtained during this period, as well as the greater probability that cases of any disease will be reported as it becomes increasingly rare, and the greater accessibility of recent literature, there is reason to believe that chronic glanders is becoming an increasingly rare disease, despite the actual increase in the number of cases during late years.

The paucity of cases reported during the period from 1861 to 1880 is noticeable. More than one reason can be assigned for this phenomenon. Some care as to the prophylaxis was beginning to be taken during this period, although sure means of diagnosis were not yet available for doubtful cases. However, the main reason for this is probably further to seek. When knowledge of human glanders was a new thing, the interest in this novel disease led to a relatively large number of cases being published. But by 1860 human glanders had taken its place as a well recognized disease and was no longer regarded as a curiosity, and for this reason cases were allowed to go unreported.

INFECTION FROM MAN TO MAN NOT UNCOMMON. — Next to relationship with diseased horses, CONTACT WITH HUMAN GLANDERS is the commonest source of the disease in man. Infection from man to man is in all probability less rare than is generally supposed. Indeed, considering the small number of persons who come in contact with human glanders as compared with those who have regular dealings with glandered horses, the risk of contracting glanders from a diseased man would seem to be very much greater than the risk of a man acquiring it from a diseased horse. In the present series 15 cases were directly associated with other human cases. Three times the infection of both cases was probably from a common equine source (Tytler (32), Mahood (33), and Lesur (71)); eight of these cases acquired the disease by contact with previous human cases (Auer's 2nd (88), Cooper (94), Kernig (95), Gralewski (117), Batko's last three (136), (137) and (138), and Jenckel (143)). In five other cases the patient in the present series is said to have given the disease to another human being (Stanley & Brush (30), Lhommau & Rocher (40), Walton & Coumbe (81)†, Nencki & Pruszynski (125),and Batko's first (135)). Be-

*This paper was completed in November, 1905.

†In this case, the communication of glanders to the patient's nurse is very doubtful, so it is excluded.

sides this there were three other cases acquired indirectly by doing experimental work in connection with previous cases of human glanders (Pepper (109), MacCallum (142) and Stuart (147)). That is to say, no less than 18 of the present series of cases, or about 12 per cent., were directly or indirectly associated with other cases of human glanders, and in 15 of these cases, or 10 per cent., this association was of an etiological nature. That one case in every ten of chronic human glanders causes or is caused by another human case is a fact not sufficiently known to the medical profession.

The predecessor of Tytler's case had contracted glanders from the same horse; the husband of Mahood's case was fatally infected after eight weeks and the father of Lesur's case was fatally infected at the same time as patient. Auer's second case and Cooper's were infected by their husbands, probably per vaginam; Kernig's case was infected by an autopsy on a case of human glanders, an abrasion being denied; Gralewski's case infected himself by scratching while looking after his glandered son. Batko's first case (father) infected his youngest child (nasal symptoms); his wife was then infected by dressing her husband's ulcers, and the remaining child was infected (nasal symptoms) by one of the others, probably her sister. Stanley and Brush's case fatally infected his nurse; Lhommau and Rocher's case gave fatal acute glanders to Rocher; Walton and Coumbe's case was said to have caused sloughing of the tonsils in his nurse; the physician operating on Neneki and Pruszynski's case inoculated a small wound and died of acute glanders; and as already stated Batko's first case caused the infection of the entire family. In Pepper's case a physician, doing experimental work with material from human glanders, inoculated an abrasion; Stuart's case also infected a small wound while doing an autopsy on a guineapig experimentally inoculated from human glanders; and MacCallum's case was inoculated by pricking his finger with a syringe containing a culture of the Bacillus Mallei.

Inoculation of an abrasion with the discharges, washing contaminated clothes, coitus and the performance of a post mortem examination are means of transferring the infection from man to man that require mention.

AGE. This appears to be an etiological factor only in so far as persons of a certain age—adults—are more exposed to sources of contagion than are others. Just as the other infective granulomata may be contracted by those at any period of life, no age is exempt from glanders. The age is stated in 94 of the 156 cases and averages approximately 33 years. Nearly 60% of the cases are between the ages of 20 and 40

AGE.	NO. OF CASES.	AGE.	NO. OF CASES.
0- 5 years	3	35-39 years	11
10-14 "	2	40-44 "	7
15-19 "	8	45-49 "	6
20-24 "	16	50-54 "	10
25-29 "	13	55-59 "	3
30-34 "	12	60-75 "	3

SEX: Confers no immunity. There is no reason to suppose that

women are less susceptible to the disease than are men. It is true, women have not as a rule much to do with horses, and for this reason glanders is a much rarer disease in the female than in the male. 11 cases of the 156 (7%) were females. It is very interesting to note that more than half of these females were infected directly or indirectly from previous human cases and that only two of the remaining five were known to have been infected by horses, the source of the disease not being established in the other three cases. Of the two cases contracted from horses one was a child of three playing about a glandered smithy, the other was a woman who had partial charge of a glandered horse that lived in the dwelling.

REGIONAL DISTRIBUTION. There is reason to think that wherever horses are, glanders may, and as a matter of fact does, exist. Every continent has furnished cases. Judging from the cases reported it would seem that the disease is at the present time most prevalent in Cuba and in some of the countries of Europe, particularly Russia; but there is reason to believe that the disease among men is much more prevalent, in other countries as well as in those mentioned, than is generally supposed, or than might be inferred from a study of the number of cases reported in medical literature. To cite one or two examples in proof of the truth of this statement: in one veterinary journal alone, the London Veterinary Record, the writer found 10 reports of five cases of recent human glanders within a period of five months (May to September 1905). All these cases were diagnosed bacteriologically and all occurred in London, yet only one of them has apparently found its way into medical literature. Again, but two cases of human glanders have been reported as occurring in Canada during the last 50 years, and yet the very partial inquiries the writer has made have brought to light, in addition to his own, two indubitable cases and three other probable ones, most of which have occurred in the last four or five years. In short, human glanders is not by any means the obsolescent disease that it is generally considered by the medical profession to be. It is probable that hundreds of cases annually find their way into the mortality records of the civilized countries of the world, classified as typhoid, septico-pyæmia, erysipelas, tuberculosis, syphilis, &c., which should properly be put down to glanders.

As to the present series, investigations were only made in the records of three languages, consequently British, German and French cases predominate. As in some instances it was not possible to fix accurately the nationality, the following division can only be regarded as approximately correct:

British Isles,	39 cases	Belgium,	7 cases	Canada,	3 cases
France,	35 cases	Italy,	6 cases	Cuba,	2 cases
Germany,	34 cases	Holland,	3 cases	Philippines,	1 case
Russia,	15 cases	Roumania,	3 cases	Switzerland,	1 case
United States,	7 cases				

THE VIRULENT MATERIALS. Before inquiring into the mode of entrance of the poison, it may be well to consider by what means the disease is spread, i.e what are the materies morbi. For practical purposes the blood of diseased horses and men does not contain the bacilli.

It is true that the disease spreads in man more by the blood channels than by the lymphatics, so that the blood in all probability usually contains a very small number of the bacilli, but these are so scanty that the writer has only met with records of one case, an acute one, in which the bacilli could be isolated from the blood. Nor do the secretions, such as the saliva, tears, nasal or buccal secretions, milk, bile, urine or fæces contain the germs, unless specific glanders lesions exist in such situations that the discharge from them becomes mingled with these secretions. The discharge from the nose, the mouth, or the eye, when these mucosæ are affected, the sputum when there is laryngeal, tracheal or pulmonary involvement, the secretion from an ulcer or sinus, the pus from a farcy abscess, the fæces when there are specific lesions in the intestines or the liver, the urine in those rare cases where renal foci exist*; these are what spread the disease. In short, the only practical source of contagion is the specific glanders lesions and the discharges from them.

The discharges from all glanderous lesions should be considered dangerous, although, particularly in old lesions, the bacilli may be very scanty. One additional fact in this connection should be noticed In one of the present series of cases virulent glanders bacilli were found in the mouth of a patient even after the complete healing of the specific ulcers; so that it would appear necessary to continue measures of local antisepsis and of care as to the discharges for some time after the lesions have completely disappeared.

Mode of entrance of the poison. In HORSES the contagion is most frequently conveyed by means of fodder, bedding, mangers or drinking pails contaminated with the discharges, though the poison may be directly communicated from one animal to another, particularly when the animals have free access to one another. Possibly the bacilli cannot enter through the intact skin, though no abrasion is too small to permit their passage. It is even considered uncommon for the poison to enter the system through an intact mucous membrane, though the possibility of such an occurrence cannot be denied. McFadyean gave glanders bacilli in a hollowed-out carrot, taking special care to see that the carrot was swallowed whole, and as a result got typical glanders with the usual pulmonary lesions and in some cases with scarcely any abdominal lesions. These experiments, and those of others, as Nocard, who claimed to be able to produce the usual pulmonary lesions seen in equine glanders, only when the germs were introduced through the alimentary tract, seem to show that horses are commonly infected through the intestinal tract, though it is not disproved that infection in the horse may occur by way of the respiratory mucous membrane. Renault is authority for the statement that so quickly is the poison absorbed from the abraded skin or from a mucous membrane in the horse that cauterization of the area infected, as short a time as one hour after inoculation, is powerless to prevent the development of the disease. Travelling by the lymph channels to the nearby glands it thence reaches the blood and settles most frequently

*The urine from two human cases was inoculated into animals when the disease was acute, both times with negative results.

in the lungs, but in other regions as well. The kidneys are very rarely affected. In rare instances the disease has been communicated from mother to fœtus.

In MAN, judging from those cases where we can trace the infection, the virus seems to gain entrance most frequently through a wound or abrasion of the skin. Travelling by the lymphatics at first, the bacilli usually produce a lymphangitis, frequently with numerous foci of suppuration along the course of the lymphatics, and at times lodge in the glands, producing an adenitis which may go on to suppuration. Thence the virus enters the blood and as it lodges in various regions, thrombi and emboli are formed which are the starting point of the specific lesions which cause the various manifestations of the disease. This was the commonest mode of infection in the present series of cases. In at least 44 out of the 156 cases (28%) the poison entered the system by a definite stated abrasion, and if we look at the matter from another standpoint we obtain confirmatory evidence of this statement. A consideration of the site of the primary lesion, which is mentioned in 125 of the 156 cases, shows that in 45 of these the primary lesion was on the hand, in 7 additional cases it was on the arm, while 12 times it was about the face and 13 times on the neck. That is to say, in 67 of the 125 cases, or over half, the primary lesion was in the skin or subcutaneous tissues of the face, neck or upper extremity, the parts of the body which are most subject to trifling injuries, as well as most exposed to contact with the virus.

It is perhaps not advisable to be too dogmatic as to the invariable necessity of an abrasion being present in every case of human glanders in which the poison enters through the skin. In several such cases of our series it is distinctly stated that there was no abrasion, and such statements are not to be lightly disregarded. At the same time may be pointed out that trifling losses of cuticle are present unsuspected in a great many persons, as may be demonstrated by having a number of people with supposedly intact epidermis dip their hands in naphtha or some similar liquid, which calls attention to trifling abrasions by the smarting it causes on coming in contact with them; and without denying the possibility of infection through the unbroken skin it may be asserted that such means of infection are distinctly uncommon.

Though the evidence at our disposal from a consideration of these cases points emphatically to inoculation of an abrasion as by far the most common mode of entrance of the poison, other methods of infection undoubtedly occur. Judging again mainly by the position of the initial lesion,* it appears that in 30 of these cases the poison entered through one of the mucous membranes. Of these the nasal mucosa was affected at the outset in 13 cases†; twice there was a dis-

*It may be frankly admitted that it cannot be invariably inferred that because the first lesion appeared in a certain region, the poison first entered in that region, but this seems to be true in the majority of cases, and in most cases we have no more accurate means of judging as to the way in which the germs enter the system.

†In one case where the patient touched his nasal mucosa right after the sneezing of a glandered horse and cervical adenitis followed, it is considered that the poison entered by way of the nasal mucosa.

charge from the ears simultaneously; three times the conjunctiva or lacrymal sac showed the first lesion*; the buccal mucosa was affected first in 4 cases, in 2 of which there was swelling of the tonsils. In 7 cases the germs appeared to enter by the respiratory mucosa, for once hoarseness began the disease, once hoarseness and dry cough, three times cough or bronchitis, and pleurisy twice. Vaginitis twice began the disease. Diarrhœa at the outset of at least one case suggests the possibility of human infection by way of the alimentary tract.

It is certainly not possible to assume from these cases that an abrasion of the mucous membrane was generally present, but it may be pointed out that in certain of these cases a definite injury to the mucous membrane appeared to determine the lesion there, and it may be added that many veterinarians are of the opinion that absorption of the glanders poison through an intact mucosa in horses is of exceptional occurrence. Also the fact that one eye or one nostril may be affected at the outset of the disease for a considerable period during which its fellow remains healthy, suggests the existence of some such local determining cause as an abrasion.

In those fulminant cases in which the disease appears to be systemic from the first, the poison may be so rapidly absorbed or so virulent that there is no reaction on the part of the lymphatics or glands, or it may be that the germs are in such cases absorbed directly into the blood, just as may occur in the most virulent forms of septicæmia.

The Lesions in Man. Whatever its situation, the glanders lesion is essentially the same. The numerous differences in its appearance in the various organs and in different individuals are due to differences in the structure of the tissues and to a variation of the relation between the virulence of the germ and the resistance offered to it by the organism. It will be well, then, to describe the mode of formation and the structure of the glanders lesion in general before considering the modifications met with in different localities.

Having gained access to the lymphatics or the blood vessels, the bacilli lodge in various parts of these channels. First of all, probably, the bacilli gain access to the endothelial cells lining these vessels and cause the death of these cells and their partial detachment. The break in the endothelial lining predisposes to thrombosis, and the thrombus forms an excellent culture medium for the bacilli to continue the growth already begun in the endothelial cells. Portions of such infective thrombi becoming detached may be carried along to form emboli. In striking accordance with the embolic origin of some of the foci is the fact that in one prolonged case, that of Holmes (113), the lesions were always recognizable by the patient before any objective signs were present, by the sharp stinging pain which appeared in the part. In two other cases, those of Wade (13) and Lesur (71), sharp pain in the eye probably marked the onset of a similar embolic process. By positive chemiotaxis polymorphonuclear leucocytes are attracted to these areas and crowding round the bacilli form the centre of the

*A case in which sudden, sharp pain in the eye was followed immediately by swelling of the pre-auricular gland is included here.

lesion. McFadyean in his latest communication on Glanders* asserts emphatically that this aggregation of leucocytes is the first and the essential occurrence in the formation of all glanders foci. A striking feature of glanders lesions, one which is never so well marked, according to McFadyean, in any other disease, is the rapidity with which nuclear destruction (chromatolysis) takes place and the persistence with which the nuclear fragments remain as deeply staining debris, rendering the attempt to identify the bacilli in sections very unsatisfactory. It is thus a common thing in glanders lesions to be able to recognize under the microscope the shadowy outlines of cells that have entirely lost their nuclei. Liquefactive necrosis of the leucocytes and the tissues involved may occur, so that incision of a focus may reveal only an oily fluid (fatty oil) comparatively free from cellular elements.

The leucocytic accumulation is however but one part of the process of formation of the glanders lesion. Epithelioid cells are seen about the central accumulation of leucocytes. These are probably derived from the pre existing connective tissue cells of the part by a process of active proliferation due to the irritant effects of the bacilli or their toxins, since in the older lesions all grades of transition from these more central epithelioid cells to the peripheral adult connective tissue capsule, which tends to wall off the lesion, may sometimes be seen. Giant cells are not infrequently visible in the developing connective tissue in the older lesions, but are less numerous and less widely scattered through the lesion than in tuberculosis.

These two opposite processes leucocytic accumulation and neoplastic formation may be combined in various degrees. It is in this way that we find the glanders lesion may vary between the extremes of an abscess with no tendency to new growth on the one hand and an apparently solid tumor on the other, though in all lesions at some stage a certain degree of both processes is to be seen.

From this description it is apparent that the glanders lesion is closely allied to an inflammatory process with abscess formation, on the one hand, and to neoplastic formation on the other; but, according to McFadyean, it has features which differentiate it from both these. "From an inflammatory process it is to be distinguished", he says, "by the rapid destruction of nuclei with persistence of thin, deeply staining fragments, and from new growth by the presence, from the earliest stage in the lesion, of a centre definitely necrotic, and by the more marked and more permanent degree of chromatolysis present." It may be doubted, however, whether pathologists in general would be willing to commit themselves to the definite statement that a given lesion was or was not glanders simply from an observation of its microscopic appearances. Grossly, a recent typical glanders lesion of small size, such as is found, say, in the lung, shows a central opaque area of necrosis surrounded by a translucent gelatinous zone (translucid tubercle), outside of which again is a hyperæmic area. In older lesions the centre is usually dry and cheesy and in place of the surrounding hyperæmia is an area of fibrous tissue tending

*Journal of State Medicine, London, February 1905.

to wall off the lesion. Calcareous degeneration is much rarer than in tubercular lesions, though Babès holds that it may occur.

All grades between a practically solid tumor and a pure abscess, with or without signs of inflammatory reaction, occur in the SUBCUTANEOUS TISSUES AND MUSCLES, where the lesions in man are most common. Here their size varies from a scarcely perceptible lesion up to that of a hen's egg or larger. Their preferred site is on the extremities, but they may occur anywhere. In muscular foci at times no pus can be obtained on incision, only a little oily fluid (farcy oil). Such contents are often obtained on cutting into a hard tumor showing no signs of fluctuation. Where the foci contain pus, and such lesions are the rule in the subcutaneous and muscular systems, this is often, though not invariably, viscid, yellowish or greenish in color, or reddish or brownish from admixture with blood. Such pus contains more albuminous material and fewer cellular elements than ordinary pus, but nuclear debris resulting from the chromatolysis is usually very evident. Not infrequently no bacteria whatever can be demonstrated on staining such pus and the ordinary pyogenic organisms are quite commonly absent.

Like most glanders lesions these abscesses are very stubborn about healing. Partial healing often takes place, but extensive breaking down of tissue may occur, even when drainage is of the freest. In this way very extensive loss of substance may occur, and in such cases if healing takes place there is much cicatricial tissue, and large radiating scars may result, which are sometimes held to be rather characteristic of the disease. In an otherwise healed lesion sinuous tracts are apt to remain for months, secreting a turbid, serous fluid. Even after it has been perfectly healed for some time a focus may break out afresh. A phlegmonous inflammation of the skin and subcutaneous structures may occur. It is due to a spreading lymphangitis. It occurs on the face much more frequently than elsewhere, and often leads to local gangrene, more or less severe, which may involve the bony structures as well as the soft parts.

In the SKIN the lesions are often small, pea-sized or smaller, and closely resemble the lesions of small-pox, but foci the size of a 50 cent piece or larger may occur. They first appear as reddened, 'flea-bitten' macules, which rapidly become hard, shotty papules, on a reddened base. They may be surrounded by an area of firm, white œdema. This appearance is rare, but very characteristic when present. Usually, but not invariably, the papule rapidly breaks down centrally to form a vesicle or pustule, which may become umbilicated. By necrosis of the central skin an ulcerated spot is formed. The evolution of these papulo-pustules is as a rule rapid, but may be very slow, as in our own case. They may appear in successive crops, after the fashion of chicken-pox lesions. Rarely the rash does not go beyond the papular stage, but disappears, usually with some local desquamation. After breaking down, as is the rule, healing may occur promptly or slowly. Or, particularly if but a few skin lesions are present, they may long remain in a stationary condition. The lesions may appear in little groups and seem especially prone to develop in connection with phlegmonous areas. Or adjoining lesions may coalesce to form a

crater-like, punched-out ulcer with elevated, perhaps overhanging edges and a serpiginous appearance. If the lesions are very superficial, blebs containing fluid, serous, blood-stained or purulent, may form. If hæmorrhage occur into or about the lesions, the rash is purpuric. Where the individual lesions are large a pemphigus-like rash is seen.

The foci in LYMPH GLANDS need no special description. Two enlarged glands removed fairly early from our own case showed general hyperplasia of the gland, with a small softened area in the central portion of the gland containing viscid, mucoid looking material.

On the MUCOSÆ, e.g. of the nose or mouth, the lesions are at first similar to those seen on the skin, but ulcers form rapidly and may become large. They are apt to have the same sharply defined borders as the skin ulcers. Such ulcers often secrete a thick ropy pus, yellowish, greenish, or mixed with blood, but the discharge may be thin and watery. Frequently it is offensive, but this is by no means always the case. It is said that the purulent secretions in glanders are only offensive where there is mixed infection, and certainly in our own chronic case, where no mixed infection was present, the discharges were never offensive. It would seem that purulent discharge may occur from mucous membranes at times, e.g. from the conjunctiva or the vagina, without definite ulceration, so that it would certainly be going too far to attribute nasal discharge altogether to the secretion from the ulcers. It seems clear that a general specific infiltration of the mucous membrane may occur, somewhat analogous to the phlegmon developing in the skin and subcutaneous tissues. Favorite seats of ulceration are the nasal septum, the soft and hard palate, and the region between the base of the tongue and the epiglottis. Suppurative otitis media may occur; laryngeal and even bronchial ulceration is occasionally met.

In the LUNGS the individual lesions are generally small, and when scanty they are mainly subpleural. Each lesion shows its necrotic centre, which can readily be removed. In recent lesions the centre is soft, of a dirty yellow-grey color, surrounded by a translucent zone, outside of which is an area of intense reddening. In old lesions the centre is yellowish, rather dry and brittle, very rarely calcareous; then comes the translucent zone surrounded by fibrous tissue. Though usually small in the lungs, exceptionally these lesions may soften and coalesce, forming large necrotic areas or even definite abscesses. The appearances of acute pulmonary glanders are thus practically those of broncho-pneumonia in some cases. In others they may more closely resemble miliary tuberculosis, from which however glanders lesions are readily distinguished by the presence of the necrotic centre even in the very earliest stages of the nodules.

Except in the mouth and throat, lesions in the ALIMENTARY TRACT proper are not common. However, small nodules which may go on to ulceration have been described in the bowel and even in the stomach. Such ulcers apparently do not commonly develop in the lymphoid elements and are thus distinguished from typhoid ulcers. In one case of this series nodules formed in the peritoneum covering the bowel.

In the LIVER and in the SPLEEN, breaking down of the foci with

the formation of multiple minute abscesses is the rule when these organs are affected. The vascular origin of the foci in these organs is often very clear. RENAL foci, while less rare in man than in the horse, are still very uncommon. When present they are usually similar to those seen in the liver and spleen.

Reference may be made to curd-like masses which are occasionally met with between the skull and dura mater, or in other regions, as on the surface of the liver or spleen, beneath their capsules. They formed a noticeable feature in the writer's case. These masses closely resemble certain forms of syphilitic gumma. They may attain a considerable size (hen's egg). Practically structureless microscopically, they show the deeply staining nuclear debris above referred to, which shows them to be the remains of nodules which have undergone practically complete necrosis. They sometimes appear to undergo at least partial organization, as is suggested by specimens from our own case.

The BONES may be involved, though not very commonly. Gangrene, secondary to phlegmonous inflammation, may extend to them. Necrosis may be due to the development of foci in the nutrient periosteum. More rarely foci may develop in the bone marrow, causing osteomyelitis, or in the cancellous tissue of the bones.

Amyloid disease may follow the prolonged suppuration.

Post Mortem Findings in 44 Cases*. In many of the cases here included, the autopsy records are very meag[illegible] general, external lesions that were recognized or should have been recognized during life are not here referred to, e. g. eruptions, abscesses, gangrene, nasal or buccal ulcerations, &c.

The following BONY LESIONS, noted in 6 cases or 14% of the autopsies, each occurred once: Caries of occipital bone with perforation, caries of cranial bones with two perforations, necrosis of upper jaws, osteomyelitis of femur, caries of lower tibia and fibula, and caries of tarsus.

INTRACRANIAL LESIONS occurred 7 times (16%). Once a walnut-sized nodule was found in the right hemisphere. In five of the remaining cases (11%), localised purulent collections, sometimes inspissated, occurred between the dura and skull, generally over the convexity of the hemispheres. Once there was a leptomeningitis of the interpeduncular space also. It thus appears that LOCALISED PURULENT EXTERNAL PACHYMENINGITIS is a rather characteristic feature of glanderous intracranial lesions, as it occurred in 11% of the autopsies. Once there was pus in one of the cerebral sinuses and once infarction of the brain.

PLEURAL adhesions were mentioned 7 times (16%); nodules in the pleura once, 'pleurisy' once, serous pleural effusion once and an abscess in the pleural cavity once.

RESPIRATORY TRACT. In one case in which the viscera con-

---

*The autopsy on Hertel's case of combined glanders and tuberculosis is not included, because of the impossibility of stating definitely which lesions were glanderous and which tuberculous. Several other cases on which an autopsy was performed are not included because the only note of it obtained was the presence of "muscular abscesses" or "nasal ulceration."

tained glanders abscesses the trachea was one vast cicatrix. Tracheal and bronchial ulceration or cicatrization is mentioned in a few cases. The one remarkable feature with regard to PULMONARY involvement is the frequency with which small tumors, broncho-pneumonia, small abscesses, or some form of pulmonary consolidation occurs. In 31 cases or 70% of these autopsies, practically every case in which any pulmonary abnormality is noted, some consolidation occurred. In many cases the description given is unsatisfactory, so that a detailed description of the findings in the several cases would not be profitable, but it may be pointed out in general terms that the individual lesions when most characteristic were firmly imbedded in the lung substance and small — pea-sized very often —as a rule with a caseous centre of necrosis and a tendency to extreme engorgement of the surrounding pulmonary tissue, without definite hepatization in the engorged area, when the lesions were comparatively recent. When older, the nodules showed a tendency to fibrosis and engorgement was not common. Babès found definite calcification of the nodules, which is generally held to be of rare occurrence in human glanders, in a case where the bacilli were present in the lungs in pure culture. At times the individual lesions appeared to coalesce, causing a massive consolidation. In a few such cases, the tendency to necrosis in the lesions being strong, a condition that approached abscess formation was found. The tendency of the pulmonary nodules to affect mainly the subpleural regions was also marked in several cases. In one case, however, it is noted that both apices were the parts mainly affected.

ALIMENTARY TRACT. Once the STOMACH contained nodules and once shallow ulcerations, the latter probably due to post mortem digestion. The BOWEL once showed on its peritoneal surface flat granulations, caseous internally, and once, apparently in its mucosa, nodules, many of which were ulcerated in the colon, though the lymphoid elements were normal. Once there was acute colitis.

AMYLOID DISEASE of the liver, spleen and adrenal was found in our case (155), and amyloid disease occurred also in Kernig's case (95), which was complicated with syphilis. In one of Besnier's cases (103) the kidneys were lardaceous looking. Fibrinous perihepatitis and perisplenitis also occurred in our case, and in another there was perihepatitis.

The LIVER was fatty twice, twice it contained 'nodules', and four times small abscesses, three times apparently in the course of the vessels. Pus in the portal vessels was noticed three times and once there was pus in the splenic vein. Jaundice was found twice. Once it affected only the left lobe of the liver and was due to obstruction of a large branch of the left hepatic duct by inspissated material from an hepatic abscess. Three times it is said that the liver was 'enlarged', once it was large, hard and pale, once it was soft, once there was 'hepatitis'.

The SPLEEN was enlarged 11 times. Once there was splenic infarction, 'nodules' were present five times, and 'abscesses' four times.

The KIDNEYS three times showed parenchymatous nephritis, once 'nephritis'; twice they contained 'nodules'.

Once the curt statement is made that general signs of septicæmia were present.

The important facts of these autopsy findings are the commonness of pulmonary and pleural involvement; the possibility of involvement of stomach, bowels and peritoneum; the frequency of purulent pachymeningitis; and the not uncommon occurrence of pyæmic manifestations.

Symptomatology and Course. We are here concerned only with chronic glanders. But at the outset we are met with the difficulty that there is no essential difference between acute and chronic glanders as to symptomatology. In the study of a large number of chronic cases the writer has been struck with the frequency of occurrence of symptoms that are supposed fairly characteristic of the acute as distinguished from the chronic form. A comparison of the results of analysis of a corresponding number of acute and chronic cases would no doubt show interesting differences in the frequency with which individual symptoms are met in the two classes of cases; but what concerns us here is only the fact that the symptomatology of chronic glanders includes the whole of that of the acute disease as well, for chronic glanders frequently ends with acute symptoms and, though this is more rare, cases with a typical acute onset may run a chronic course.

Glanders and farcy will not be considered separately. As Koranyi says, writing in Nothnagel's Specielle Pathologie and Therapie, "though glanders and farcy are usually described separately, in concrete cases the symptoms of glanders and farcy go hand in hand." The division into glanders and farcy was made at a time when they were considered to be two entirely distinct diseases. At the present time the line of division between them is not one that can be clearly drawn, and now that for many years they have been proved to be one and the same disease, there does not seem to be any sufficient reason for continuing to consider them separately, particularly as the present series of cases apparently shows that the supposed difference in virulence between the two forms, which no doubt tended to perpetuate the division, has no real existence.

Period of Incubation. The period of incubation in a few cases seems to have been only a few hours. Probably in the majority of cases it is from one to five days, but it may be extended up to two or even three weeks. It is said that the period of incubation is longer when the poison enters otherwise than through an abrasion. In two cases of the present series, however, in which it is said that the poison entered without the presence of an abrasion, the latent period was but a few hours. Of the present series of cases the period of incubation could only be ascertained in 26 cases.

INCUBATION PERIOD.	NUMBER OF CASES.	INCUBATION PERIOD.	NUMBER OF CASES.
Few hours.....	3	7 days	2
24 "	3	8 "	1
48 "	6	Under 14 days	1
4 days	3	15 days	1
5 "	1	Under 21 days	1
a few "	3	21 days	1

The average incubation period for the 21 cases in which it could be accurately estimated was four and one-third days. Cases in which the period of incubation appeared to be several months, or even several years, occurred in this series, but such cases are probably examples of latent glanders and will be more appropriately considered under that heading.

MODE OF ONSET AND INITIAL PHENOMENA. As has been previously pointed out, in chronic human glanders the infection appears to take place most frequently through a wound or abrasion of the skin. When this takes place there are apt to be signs of local trouble. Pus often forms in the wound or abrasion, there is swelling and infiltration of the neighboring tissues, local ulcers may form with raised, irregular and overhanging edges and sloughy yellow or greyish bases. Proceeding from the wound towards the neighbouring lymph gland are often to be seen the red streaks denoting a lymphangitis. 27 cases of the present series (17%) showed a lymphangitis of the arm at or near the onset of the disease. Nodular swellings (farcy buds) often appear in the course of the inflamed lymphatics and usually break down, forming abscesses. The overlying skin ulcerates and the lesions so formed may spread and coalesce into serpiginous ulcers. These lesions are very stubborn to heal in the majority of cases, and, like the lesions elsewhere, may give rise to sinuses, secreting a thin sero-pus. Adenitis in the lymph glands connected with the inflamed lymphatics commonly follows and the glands may break down. Adenitis at the onset, usually associated with lymphangitis, is mentioned in 10 of these cases (6%). In other cases local signs may be entirely wanting. Garstang's first case (93) is an excellent example of how trifling the local manifestations at the site of entrance may be. A wisp of grass was used to wipe the discharge of a glandered horse from an arm showing no abrasion. On the day following a slight rash appeared in this area, which disappeared in a day or two. There was no pain, lymphangitis or other local disorder in the arm, apart from this, but glanders followed.

When the virus enters through a mucous membrane, ulceration usually occurs, though it cannot be said from the statements made regarding these cases that this invariably takes place. The papular and pustular stage which has occasionally been noticed to precede ulceration in secondary lesions of mucous membranes, does not appear to have been observed in any primary mucosal lesion, perhaps because

cases do not as a rule come under medical observation at a sufficiently early period. As in the skin, the ulcers often have a punched-out appearance and may become serpiginous. Increased secretion from the mucosa affected almost always occurs. It is often attributed to a secretion from the ulcer itself, but such an explanation fails to account for those cases where no ulceration is noticeable, as is frequently the case in the conjunctiva. Besides, when the secretion is so irritating that it can cause excoriation of the skin, as has sometimes been noticed, it is certain that its passage over a mucous membrane would cause inflammation locally and bring about increased secretion in this way. It would seem reasonable to assume that the specific poison may cause a more or less general inflammatory condition of the mucous membrane without ulceration. Such an assumption is quite compatible with the view—if it be adopted— that in an initial lesion of a mucous membrane the bacilli almost always gain entrance by an abrasion. The secretion is very commonly mixed with blood, but may be yellowish or greenish. When most typical, it is at first a thick, gluey mucus, probably tinged with blood; later, a ropy, viscid mucopus; but not very rarely the discharge is thin and watery. It may be very irritant, causing excoriation of the skin over which it runs.

Where the history of the case gives no hint of how the germs gained access, it may be considered that in a very general way the position of the first lesion gives some information as to the mode of entrance of the poison. It may be pointed out that this inference seems to be less justifiable when the first lesion mentioned is on the lower extremity than when it is elsewhere, seeing that in several of such cases the lesion has not appeared for a period varying from some weeks up to fifteen months after the onset of the first symptoms. A brief tabular statement of the locality of the first lesion follows:

PRIMARY LESIONS.

Not mentioned	30 cases

SKIN OR SUBJACENT PARTS—95.

Hand	45	cases
Arm	7	"
Face and head	12	"
Neck	3	"
Trunk	6	"
Legs	22	"

MUCOSÆ—30.

Nose	13	cases	(ulceration or discharge)
Mouth	4	"	(ulceration or inflammation)
Eye	3	"	(lacrymal fistula twice)
Respiratory tract	7	"	
Gastro-intestinal	1	"	(primary diarrhœa)
Vagina	2	"	

This distribution of the primary lesions would lead us to infer that the poison is absorbed through the skin three times as often as through a mucous membrane, and that in more than half of all cases —65 out of 125—it is from the skin of the exposed parts of the body that absorption takes place, and that in about half the remaining cases the poison gains admission through the exposed mucous membranes, seeing that the poison can enter the alimentary or respiratory system only through the mouth or nose. And the frequency with which the nose and respiratory tract show the first lesion (two-thirds of all primary mucosal affections) suggests that they are loci minoris resistentiæ, or that they are more exposed than other mucosæ to infection.

However the virus enters, the invasion is likely to be accompanied by certain CONSTITUTIONAL SYMPTOMS. It may be said that in comparatively few cases are the subjective symptoms gone into as thoroughly as could be desired. General MALAISE, inertia or distaste for work, referred to 17 times, is comparatively common.

FEVER is not necessarily present at the onset of chronic glanders, but is of frequent occurrence. It is mentioned, apart from chill, 11 times (7%) at the onset in this series. It may have a gradual step-like rise and be accompanied by symptoms leading to a strong suspicion of typhoid. In other cases chill and definite RIGOR, seen at the onset in 19 cases of this series (12%), occur. These are sometimes accompanied by definite sweating and may be repeated. After such rigors the temperature may be normal for some time, or there may be evening rises. The most characteristic feature of the temperature in chronic glanders is its irregularity, with a strong tendency to assume a septic type, much as in chronic tuberculosis.

PAINS, generally rheumatic and mainly in the extremities, occurred 22 times (14%) as an initial feature of the present series. PURULENT FOCI, apart from those secondary to lymphangitis, are very common at the onset (30 times (19%) here). VOMITING began the disease in but four of these cases; ANOREXIA at the onset is not uncommon; initial DIARRHŒA occurred once in this series. A RASH, usually local and pustular, was observed near the beginning of the disease in 13 cases, and LACRYMAL FISTULA twice. NASAL MANIFESTATIONS, either catarrh or ulceration, were seen at the onset in 13 cases (8%), in two of which there was also EAR DISCHARGE. SORE THROAT and ENLARGEMENT OF THE TONSILS each occurred one at the beginning of a case. Initial LARYNGITIS seemingly occurred wice, PLEURISY twice and BRONCHITIS three times. PERIOSTITIS was once the first complaint and once it was PAIN OVER THE LIVER.

PHYSICAL SIGNS. When the bacilli, travelling as a rule from the point of entrance by the lymphatics to enter the blood, have once reached the blood, they are probably carried from one place to another mainly by means of the blood channels. They may settle in any part of the locomotor system and form the starting point of lesions there. Moreover, from ANY focus the bacilli are liable to be absorbed into the lymphatics and to travel by them. In this way both the blood-current and the lymph-stream are factors in the spread

of the disease, carrying the germs to the locomotor system, mucous and serous membranes and to the internal organs. Local infection of the accessible mucosæ and skin may be brought about by auto-inoculation with the discharges by scratching.

It follows from this that LYMPHANGITIS, though much more common as an initial manifestation, may occur at any period of the disease. In the present series it is noted 29 times (19%), the upper extremity being affected in every case but in two, where the lower extremity was involved.*

When LYMPHATIC ADENITIS occurred early in the disease, it was usually associated with lymphangitis, but in cases that occurred later such an association was not commonly manifest. It was observed in 42 cases (26%) of the present series; 3 times it was general; the cervical glands were affected 13 times, submaxillary 10, preauricular 3, epitrochlear 3, axillary 13, supraclavicular 1, and inguinal 9 times. Three times the glands affected are not specified.

PHLEGMON. Areas of erysipelatous or phlegmonous inflammation are particularly liable to develop on the head or face and form a rather characteristic feature of the disease. A tendency to sloughing, and also, it may be added, to involvement of the deeper structures and to gangrene of the soft parts is more marked than in ordinary erysipelas. At times this process is a sluggish, boggy infiltration of the tissues, unaccompanied by redness or heat, but as a rule the resemblance to ordinary phlegmon is great. Indeed, glanderous phlegmon is simply a severe form of lymphangitis, though for convenience of description it is considered separately. Phlegmon was present in 51 cases of this series (33%); 27 times on the head or face, 3 times on the neck, 8 times on the upper and 10 on the lower extremities, once on the penis, and once it spread from the ear till most of the body was involved.

GANGRENE is usually a sequel of phlegmon. It occurred in 14 cases (9%). In ten of these it was about the face or mouth, once on the neck and three times on the lower extremity. Usually it was trifling, but twice the whole face was involved. Phagedænic ulceration, which occurred in a few cases and destroyed considerable tissue, is so closely allied to gangrene that it is almost impossible to draw a definite line of distinction between the two conditions.

Usually one to four weeks after the onset, according to Koranyi, subcutaneous and muscular foci begin to form. The time of appearance of the foci is very variable, however; in some cases their development is the first thing noticed by the patient, while in other cases they are a late phenomenon. In one remarkable case of Babès they first began to appear five years after the onset of the trouble. They may appear anywhere, but are most common in the extremities, and the head and neck are more frequently affected than the body.

As the subcutaneous and muscular lesions are the most constant feature of the disease, it may be well to consider their distribution in the present series more in detail.

*Strictly speaking, plegmon should be included as a lymphatic affection, though it is considered separately.

TUMORS or swellings which did not go on to abscess formation, or which, after apparent suppuration, subsided into practically solid tumors through inspissation of the pus or disappeared entirely without operation, seem to have occurred in at least 20 cases (13%), probably in more, as the statements made are often vague. The rare cases in which definite fluctuation in such swellings was followed by their spontaneous total disappearance, at least so far as physical signs went, are of special interest. These non suppurating tumors occurred in the upper extremities 8 times, 9 times in the lower limbs and once over the clavicles. In addition there were in three cases distinct signs of inflammatory joint trouble, in the wrist, elbow, knee and ankle, which signs subsided subsequently. In one of these cases the presence of pus in some of the joints was demonstrated at operation.

SUBCUTANEOUS OR INTRAMUSCULAR ABSCESSES are by far the most constant of all lesions in chronic glanders. They were present in 130 of the 156 cases(83%). In 19 of these cases no mention is made of the locality affected, and in several others it is stated that abscesses occurred elsewhere than in the regions specified.

A brief statement of the frequency with which different parts of the body were affected follows:

HEAD AND NECK—37

Scalp, 7	Forehead, 6	Face, 23	Neck, 7

TRUNK—12

Chest	6	Epigastrium	1	Anus	1
Side	1	Lumbar	1	Testicle	2
		Labium	1		

UPPER EXTREMITIES—73

Locality not specified	26	Shoulder*	5	Upper arm	12
Elbow	8	Forearm	29	Hand †	4

LOWER EXTREMITIES—71

Locality not specified	16	Gluteal	4	Thigh	32
Anterior tibial region	7	Knee	17	Calf	26
Elsewhere in lower leg	15	Ankle	8	Foot	4

It is interesting to note that although the poison gained entrance through the upper extremities in the majority of cases, lesions in the lower extremities are practically as common as in the arms. This suggests that the more sluggish circulation in the lower extremities pre-

*The statements made in the case reports are often too general to permit the assumption that a 'shoulder' or other joint lesion involved the joint itself, though not uncommonly there was purulent involvement of the joints themselves.

†The inclusion of pus formation in a wound of entrance would make the proportion of hand lesions much larger.

disposes to the lodgment of the bacilli in the capillaries that forms the starting point of the lesions.

The tendency of these foci to develop in the MUSCLES THEMSELVES is usually strongly marked. These foci vary in size from scarcely perceptible lesions to the size of a goose egg and even larger. In some cases they break down immediately without perceptible inflammatory reaction, so that they are frequently regarded as tubercular cold abscesses, a diagnosis for which the scarcity of bacteria in the pus seems to give additional ground. In other cases, incision of a focus larger than a hen's egg, which has been developing for weeks, may reveal only a diffuse infiltration of the tissues affected, with a little reddish oily fluid in the centre of the focus, but no pus. Suppuration usually follows the opening of such a focus, and this though mixed infection does not commonly occur. As already stated there may be all grades between practically solid tumors and abscesses.

Pain and tenderness vary greatly in the foci, being entirely absent in some cases, very severe in others. This variation depends partly on locality and on proximity to important nerves. The development of a focus in the diploë of the skull led in the writer's case to a strong suspicion of an intracranial lesion. On the whole it is probable that the earlier lesions are more apt to be painful than those which occur late. In 42 cases (27%) pain in the lesions is referred to. In 12 cases the initial lesion is especially mentioned as painful*.

A striking feature of most of these lesions is their stubborn resistance to treatment. Whatever the antiseptic agents used, they often refuse to heal for many months. They may heal partially, leaving discharging sinuses, or may heal completely and then break open again repeatedly. The same focus may require operation a dozen times. The edges of an incision made through healthy tissue to evacuate an abscess are liable to become infected from the discharges. In such cases pale red, shotty granulations spring up all over the wound, usually to break down later. The retrogression and complete disappearance of foci without operation occurs occasionally, but is relatively uncommon.

The bacilli may reach the joints from the blood or lymph-channels and there set up an arthritis which is apt to be suppurative, but which seems in a certain number of cases to be non-suppurative for a long time, and which indeed may subside completely without ever proceeding to pus formation. In other cases the joint involvement is secondary to extension from near-by foci. The joints appear to have been definitely involved in 11 cases (7%) of the present series. Purulent involvement of the knee joint occurred 7 times, and in one of these cases most of the larger joints became involved; the ankle was affected 3 times, the wrists once, and once one of the metacarpo-phalangeal joints. Apparently there was joint involvement without pus formation in the knees 3 times and once in the shoulder joint. In one case where pus had been found in the ankle at operation intra vitam, there was no trace of it found at autopsy later.

*The scant attention paid to subjective symptoms in most of these cases is doubtless the reason that these figures are not higher.

Involvement of PERIOSTEUM OR BONE, is not rare. It was noted in 24 cases (15%) of the series. Usually it is secondary to lesions in the soft parts, but the bone or its marrow may be involved primarily.

BONY LESIONS.

Head, 17.		*Arm*, 1.	
Skull,	4	Bones forming wrist,	1
Jaw bones,	2	*Leg*, 6.	
Nasal septum perforated,	8	Osteomyelitis of femur,	1
Hard Palate perforated,	3	Tibia or fibula,	5
Inferior turbinated bones,	2	Tarsus,	1

As a rule when bone is involved it gradually melts away, but definite sequestra may form from the death en masse of larger pieces of bone, and in one case definite formation of new bone took place by a process of proliferative osteitis.

From what has been said concerning the mode of development of the disease, it will be seen that in chronic glanders the various local manifestations do not appear in any regular order, but that the appearance or non-appearance of a lesion in any place is dependent to a large extent upon accidents connected with the circulation. When the germs gain access to the blood in sufficient numbers, a septico-pyæmia may develop.*

CUTANEOUS ERUPTIONS. One sign which must be regarded as of grave import, indicating as it does a wide diffusion of the poison, is the appearance of a generalized ERUPTION, affecting all parts of the body surface. It is not impossible, however, for a patient to rally and to all appearance recover completely after a universal eruption.

The skin eruptions of chronic glanders are more apt to appear comparatively late in the disease than during its earlier stages. It is not however very rare for a rash to show itself at the outset of the disease. Six times a local rash was the first manifestation of the disease. Twice it began in regions the patient was wont to scratch and here inoculation probably took place by the finger nails. Once the discharge from a glandered horse, which had fallen on the unabraded surface of a man's arm, was wiped off with a wisp of grass. In this case the measure taken to guard against infection was doubtless the direct means of inoculating the germs, for next day red spots appeared on this area. They became pustular and healed in a couple of days without any sign of lymphangitis or glandular involvement, yet glanders immediately followed. This last case shows how the virus may enter without any marked local signs. It may be pointed out, in conclusion of the reference to this case, that another man with equal chance of infection, who washed off the discharge, escaped the disease. In another interesting case an abrasion, received while attending a

*Notice, however, that though pyæmia is common in chronic glanders, it is hardly ever possible to isolate the germ from the circulating blood, so that the number of bacilli present in the circulation at any one time is probably relatively small.

glandered [illegible], healed promptly, but immediately after its healing a local rash appeared on this spot and glanders followed. In the writer's case two slowly developing acne-like pustules on the forehead were the first sign. Twice a generalized eruption occurred at the onset, once purpuric [illegible] consisting of bullæ, ½ to 2½ inches in diameter.

Altogether it would appear that some rash was present in 57 cases [illegible] (37%). This eruption, however, was often very scanty [illegible] limited to two or three individual lesions in one or two of the [illegible] noted, no sharp line of distinction can be drawn between t[illegible]as and the subcutaneous and muscular foci already referred [illegible]ly for purposes of description that any attempt is made [illegible]hen most typical the eruption shows itself first as pea sized [illegible] spots [illegible] become papular, then pustular, and finally [illegible], closely the eruption of small pox. As a rule [illegible]ation of the individual lesions is more rapid than is [illegible]s, the cycle taking as a rule but 24 to 48 hours. [illegible] rapid evolution is not invariably present. In our own case the nodules on the forehead were just beginning to break down a week after [illegible] appeared.

Moreover, the eruption often shows itself in successive crops, and may appear on different parts of the body successively, and this gives an additional means of differentiating the rash of glanders from that of small pox. Ulceration does not always occur, indeed on rare occasions the rash subsides after reaching the papular stage, with some desquamation, perhaps, where the papules have been. At times spreading ulcers, which may attain the size of a 50 cent piece, or even larger, have their origin in these papulo-pustules. Large serpiginous ulcers may be formed by the confluence of adjacent lesions. A papulo pustular rash appears particularly liable to develop in phlegmonous areas. Should hemorrhage occur into the lesions one gets a purpuric rash. Where the lesions are very superficial, bullæ of various size may form, containing bloody or clear serum or turbid purulent contents. Umbilication is not uncommon in the larger lesions. Twice it is said that 'rose spots' occurred and their appearance gave increased plausibility to a diagnosis of typhoid. A wide-spread, though not always general, papulo pustular rash was seen in 16 cases. In the majority of cases the rash was local.

As to regions specially affected, we have the FOREHEAD mentioned 5 times, the FACE 14 times, the SCALP and the NECK each 3 times, the BACK twice, the UPPER EXTREMITIES 14 times, the LOWER LIMBS 9 times and the TRUNK 7 times. Twice a general eruption was purpuric and once papular. A local purpuric rash is mentioned 4 times, once each on the face, the chest, the abdomen, and the limbs. A pemphigus-like general eruption was seen three times and in 4 other cases there were local bullæ.

As to TIME OF APPEARANCE of the rash, it is noted at or near the onset in 13 cases, during the course of the disease in 25 cases, and as a terminal feature occurring within a few days of death in 27 cases.

NASAL INVOLVEMENT. There is relatively frequent involvement of the nasal cavities. This occurred in 64 out of the 156 cases (41%) The nasal mucosa is often swollen and red at the onset, and nasal breath-

ing is interfered with; later, secretion is increased. In other cases the appearance of papules on the mucosa is the first sign noticed. These become pustules and then ulcers, which may coalesce to form irregular, punched out looking, ulcerated patches, with sloughy bases and raised edges. Ulceration may extend deeply and cartilage and bone may be involved. Perforation of the bony septum occurred at least 9 times (once attributed to the use of the thermocautery) and in two or three additional cases the inferior turbinated bones were destroyed. The discharge is usually at first scanty, glairy, sticky, blood-stained mucus, which often forms crusts about the nostrils, later, it is an abundant, viscid muco-pus, yellow or green, or mingled with blood. Often the discharge is the first nasal sign noticed.

Including colds in the head nasal discharge was noted in 47 of the 156 cases (30%), in 15 of which it is stated that ulceration was also present. In at least four cases the discharge was thin and watery. Quite often it is offensive, but this is generally attributed to mixed infection, and probably in the majority of cases this offensive character is wanting. Twelve times there was ulceration without any reference to discharge. In some of these cases the ulceration was only found at autopsy. In at least two of these cases Laugier (11) and one of Tardieu's (36)), it is distinctly stated that at no time during life was there nasal pain or discharge, yet nasal ulceration was found at autopsy. According to Dr. Rutherford, a similar latency of nasal ulceration in equine glanders is of common occurrence. Indeed, when we consider how rarely the nasal cavities are carefully examined at autopsy, it is probable that nasal ulceration in human glanders is much more common than is supposed. It may be added that even in cases eventually proving fatal the clinical manifestations of nasal involvement may be only transient. One nostril may be involved alone for a considerable time. This was noticed in at least three cases of the present series.

OCULAR MANIFESTATIONS occurred in 24 cases (15%). Of these CONJUNCTIVITIS is most common. It was present in 16 cases (10%); three times the secretion was watery, and thirteen times muco purulent or purulent. Conjunctival ulceration may occur, but it was only distinctly stated to be present in two cases and appears to be exceptional. Conjunctival, as well as nasal involvement, may be transitory, but there is grave reason to fear blindness or serious damage to vision if ocular manifestations of any kind develop in glanders. Sight was lost, on one side at least, in three cases, and badly impaired in a fourth, in which spreading ulceration laid bare the muscles and nerves, though in this case from almost complete blindness vision was sufficiently restored to enable the patient to read large letters. The lacrymal sac was involved 7 times; exophthalmos occurred twice; ptosis, diplopia and hæmorrhagic retinitis each once.

MOUTH. The mucosa of the mouth or pharynx was involved, either by an inflammatory process and the discharge of a thick stringy mucus, or through local ulceration, in 31 cases (20%). Any part of the mucosa may be involved, but lesions on the tongue, save at its root, are uncommon. Ulcers about the pillars of the fauces or on the uvula or the pharynx are apt to make swallowing painful. In one

remarkable case the tonsils were enormously enlarged and the diagnosis made from microscopic examination was sarcoma of the tonsils.

EAR. OTITIS MEDIA may occur, probably from extension of an inflammatory process along the Eustachian tube, since ear trouble appears to be uncommon except in cases where the nose or throat is involved, but the possibility of specific lesions of the middle ear arising independently of nose or throat involvement must be admitted. In 5 cases of this series suppurative otitis media occurred. The specific nature of the otitis does not appear to have been investigated in any case by cultural or animal experiments. In 2 additional cases deafness is mentioned, once as a terminal feature and once as the result of an obstruction of the Eustachian tube by a mass in the pharynx.

LARYNX. Laryngeal involvement occurs not very rarely. Hoarseness or laryngeal ulceration or laryngitis was noticed in at least 12 cases (8%) of this series.

LUNGS. Invasion of the lungs may show itself by the development of cough and perhaps dyspnœa. The expectoration is very scanty at first and very sticky, later it usually consists of an abundant viscid muco-pus, though occasionally it is thin and watery. It is often mixed with blood and may be offensive, the latter probably from mixed infection. The lungs often show signs of bronchitis on physical examination, but apparently dulness is unusual, though focal lesions are common enough at autopsy. The clinical signs of pulmonary glanders, however, are deserving of more careful investigation than they have yet had and in every case of glanders routine examination of the chest should be made. Signs and symptoms pointing to pulmonary or pleural involvement were noted in 39 of the 156 cases (25%). Cough is mentioned 19 times. When associated with night-sweats and emaciation it may give rise to groundless suspicion of the presence of pulmonary tuberculosis. It must, however, be remembered that cases have occurred in which glanders and tuberculosis have been proved bacteriologically to co-exist in the same person. The present series contains one such case and others are on record in the literature. Signs of bronchitis were noted in 15 cases, but definite signs of consolidation would seem from these records to be distinctly rare, as, after excluding tuberculosis, they were only noted in 6 cases. In this respect there is a distinct discrepancy between the clinical and the pathological records, seeing that in the latter evidence of pulmonary consolidation was found in practically every case where there was any pulmonary abnormality. The explanation of this apparent discrepancy probably lies in the fact that the individual lesions are as a rule very small and liable to be separated from one another by crepitant lung substance, just as is the case in miliary tuberculosis, in which also physical signs are notoriously scanty. Tracheal or bronchial ulceration is of occasional occurrence, but as a rule is not possible to diagnose during life. One patient apparently recovered from farcy, but died a few months later of 'lung trouble.' Signs of PLEURISY with or without effusion were noted 10 times. The preponderance of lesions in the subpleural parts of the lungs suggests the possibility that pulmonary infection may occur from the pleural cavity.

VAGINITIS occurred twice, both times as an initial phenomenon,

and was acquired from the patient's glandered husband (88), (94). In another case (134) a uterine polyp which had caused several haemorrhages was found to be of an inflammatory nature on microscopic examination.

Specific lesions of glanders in the PERITONEAL CAVITY are undoubtedly rare. Ascites, the nature of which was not determined, occurred in two cases. In one case general anasarca was associated with effusion into the serous cavities, and this was more probably a general phlegmon than a cardiac or renal œdema, but this case was also tubercular. In one case, however, (Auer's 2nd (88)) nodules were found on the peritoneal surface of the intestines, so that the ascites mentioned in other cases may have been of a specific nature, analogous to the pleurisies which are not very uncommon in glanders.

Symptoms referable to the GASTRO-INTESTINAL TRACT were noticeable in 24 cases (15%). Nausea or vomiting occurred 8 times, dyspeptic symptoms 4 times. Abdominal distension was present in 2 and diarrhœa in 15 cases. In 2 there was melæna. A catarrhal condition was probably the cause of these symptoms in the majority of cases, but once nodules in the stomach and bowel, with several ulcerated nodules in the colon, were found in a case associated with melæna (Churton (99)). The Peyer's patches were normal in this case, which suggests that in a certain proportion of cases gastro-intestinal symptoms may be due to the presence of specific lesions in the alimentary tract.

JAUNDICE was present 9 times (6%). Usually it would seem to have been of a catarrhal nature, but once it was associated with the finding at autopsy of an obstruction of a main branch of the left hepatic duct by inspissated pus from a liver focus. In this case the hepatic jaundice affected only the left lobe. In another case, unfortunately not verified by an autopsy, the presence of hepatic enlargement and tenderness, etc., in association with jaundice, was thought to warrant the diagnosis of a large liver abscess.

The LIVER was enlarged 7 times, the SPLEEN being concurrently enlarged in 4 of these cases. Twice the spleen was enlarged independently of the liver.

Anæmia was noted six times, leucocytosis twice. Albuminuria was noted in five or six cases; glycosuria once. Twice the 7th cranial nerve was paralyzed and the 3rd cranial and ulnar nerves each once, in addition to one case of 'diplopia'. Twice the paralysis seemed to be due to injury of the nerve at the time of operation on a focus.

Where intracranial foci develop, the symptoms of cerebral tumor, meningitis—usually pachymeningitis—or abscess may be added to the clinical picture, but, judging from the clinical records of the cases in which there were intracranial lesions found at autopsy, this very interesting field for clinical observation has hardly been touched or else cerebral lesions caused by glanders are much more liable to latency than similar lesions due to other causes. 'Maniacal delirium', 'nervous symptoms', 'facial twitching', this is all the clinical information obtainable in cases where gross intracranial lesions were found at post mortem.

SYMPTOMS. Some of the symptoms that occur in chronic glanders deserve passing notice.

PAIN, including headache and excluding as far as possible local pain in developing foci, was referred to in 56 cases (36%). The character of the pain was most often 'rheumatic'. These rheumatic pains were referred to the joints in 7 cases, in 6 they were more or less general. Headache is mentioned 20 times, pain in the extremities 17 times, in the back 6 times, in the chest or side 6 times, over the kidneys 3 times and over the spleen once.

FEVER is mentioned in 72 of the 156 cases(46%). Probably all cases of glanders, except perhaps very mild infections that remain purely local, show fever at some time during their course. In some cases, however, fever was absent for considerable periods. When present it was of all grades of severity from a trifling afternoon rise to a continuous temperature of 104° F. In one case it reached 105⅘° F. during a chill. A septic temperature with a considerable daily variation is quite common.

The PULSE probably tends, as in typhoid, to be rather slow in comparison with the degree of fever present, at least in the earlier stages of the disease, before exhaustion comes on. In two cases it is noted that the pulse was irregular.

In a few cases thrombosis, apt to be purulent, was found in certain of the veins at autopsy, but signs of PHLEBITIS during life were only referred to in one or two cases, and the apparent immunity of the blood circulatory system itself is in striking contrast with the important part it plays in the distribution of the virus.

CHILLS or RIGORS occurred in 30 cases (19%). In 19 of these it was an initial feature. When chills occurred later in the disease, as was the case 18 times, they generally marked an increase in the activity of the disease. SWEATING is remarked in 21 cases (13%). It was frequently associated with rigors and septic temperature. In eight of these cases it is stated that the sweating was nocturnal.

INSOMNIA is noted 15 times (10%). ASTHENIA was a prominent feature in 35 cases (22%). DELIRIUM occurred in 27 cases (17%); it was as a rule low and muttering, usually nocturnal and was in most cases a terminal symptom, though it occurred in one man who was supposed to be cured. MENTAL DEPRESSION and low spirits are mentioned 11 times (7%).

EMACIATION was said to be present in 29 cases (19%). Sometimes a patient with glanders appears to be suffering from nothing more than a trifling ailment and yet his flesh and strength are rapidly failing. With the occurrence of such symptoms glanders is a disease that should be carefully considered in those who have had opportunities for infection by the bacillus mallei. Very commonly emaciation and loss of strength are associated with the development of the foci, though the patient's appetite may remain good. There is generally irregular fever at these times, often with profuse sweating and perhaps repeated chills. In comparatively quiescent intervals, even while the lesions are actively discharging, the patient may regain a measure of the health and strength that he had lost. In this remittent way the disease may drag on for years.

TABLE OF THE FREQUENCY OF THE VARIOUS SIGNS AND SYMPTOMS IN 156 CASES

(1) Subcutaneous and Intramuscular abscesses 130 (83%)
(a) Tumors not breaking down..... 20 (13%)
- Head and neck 37 (24%)
- Trunk..... 12 (8%)
- Upper extrem. 73 (47%)
- Lower extrem. 71 (45%)

(2) Lymphatic Involvement.....
- Simple Lymphangitis..... 29 (19%)
- Proceeding to Phlegmon..... 51 (33%)
- Proceeding to Gangrene..... 14 (9%)
- Lymphatic Adenitis..... 42 (27%)

(3) Fever..... 72 (46%)

(4) Nasal Involvement 63 (40%)
- Discharge only..... 31 (20%)
- Discharge and Ulceration..... 15 (10%)
- Ulceration only..... 12 (8%)

(5) Pain, exclusive of that in developing foci..... 56 (36%)

(6) Skin Eruptions 57 (37%)
- general..... 16 (10%)
- face excl. forehead. 14 (9%)
- upper extremities. 14 (9%)
- lower extremities. 9 (6%)
- trunk 7 (5%)
- forehead 5 (3%)

Erupt.
- At onset .. 13 (8%)
- Dur'g course 25 (16%)
- Terminal .. 27 (17%)

(7) Pulmonary and Pleural Disturbances .. 39 (25%)
- cough 19 (12%)
- bronchitis 15 (10%)
- pleurisy 10 (6%)
- consolidation.. 6 (4%)

(8) Asthenia..... 35 (22%)

(9) Involvement of mouth and pharynx..... 31 (20%)

(10) Rigors 30 (19%)
- At onset..... 19 (12%)
- During course..... 18 (12%)

(11) Emaciation..... 29 (19%)

(12) Delirium..... 27 (17%)

(13) Ocular Involvement .. 24 (15%)
- conjunctivitis 16 (10%)
- involvement of lacrymal sac .. 7 (5%)

(14) Involvement of Bone and Periosteum 24 (15%)
- Head..... 17 (11%)
- Arm 1 (1%)
- Leg..... 6 (4%)

(15) Gastro-Intestinal Symptoms..... 24 (15%)
- nausea and vomiting..... 8 (5%)
- diarrhœa..... 15 (10%)
- melæna..... 2 (1%)

(16) Sweating..... 21 (13%)
(17) Insomnia..... 15 (10%)
(18) Laryngeal Involvement..... 12 (8%)
(19) Mental Depression..... 11 (7%)
(20) Jaundice..... 9 (6%)
(21) Intracranial lesions, 7 (5%), including purulent pachymeningitis externa..... 5 (3%)
22) Enlarged Liver..... 7 (5%)
(23) Otitis Media..... 5 (3%)

Duration. The extremes of duration in this series are six weeks and fifteen years. The duration is stated in 138 of the 156 cases, at least roughly. An incomplete case is counted as lasting from the onset till the time it was reported and such cases are not excluded. The average duration for the 138 cases was about 14½ months, but if the complete history of all cases were obtainable, it would not improbably be considerably longer. A tabular statement of the duration of the series follows.

DURATION.			NO. OF CASES.
1½— 3 months,	inclusive,	—	40
3— 6 "	"	—	29
6—12 "	"	—	27
12—18 "	"	—	15
18—24 "	"	—	8
2— 3 years,	"	—	10
3— 6 "	"	—	7
11 "		—	1
15 "		—	1

Modes of Termination. When chronic glanders terminates favorably, it is generally by a slow dying out of the lesions. Improvement is very gradual and very uncertain, the patient being subject to fresh outbreaks of the old lesions and to the development of new ones for a long time after all signs of active trouble have disappeared. In one case of Babès (120) and another of von Baraez (139), a period of remission lasting five years was followed by fatal recurrence.

Chronic glanders may end fatally in one of several ways. Exhausted by the prolonged suppuration, the patient may become emaciated and cachectic and succumb, sometimes after developing signs of amyloid disease. A rapid generalization of the poison may occur and the patient may die in the course of a few days of acute glanders engrafted upon the chronic form. Or the process may become a veritable pyæmia. Or a fatal glanderous broncho-pneumonia may develop. Probably, however, there is less pathological ground for these distinctions than the difference in clinical appearances seems to warrant. Delirium or coma may precede the fatal termination.

Latent Glanders. Most of our knowledge concerning latent glanders as it affects horses has been acquired since the discovery of mallein. When mallein was used not only to test horses clinically glandered, but animals that had been in contact with them as well, it was almost invariably found that a large percentage of such contact animals gave a typical reaction, and lesions of glanders were found in these animals when killed, though they had absolutely no clinical sign of the disease.

We owe to Babès the first definite statement (in 1894) that in man, as in horses, glanders may exist in a latent form. It was of course known long before this that cases of human glanders might get rid of all apparent lesions and remain quite well for a considerable time, after which clinical signs might again appear. In the prebac-

terial days the occurrence of such cases afforded to the supporters of the theory of the spontaneous generation of glanders an apparently sound argument. Babès states that he had repeatedly recognized in the lungs of those who had dealings with horses and had died of other diseases, old, sometimes partially calcified tubercles, which he had been wont to attribute to tuberculosis or syphilis, but in one such case, that of a groom dead with chronic nephritis, he found the bacillus mallei culturally in the broken down pulmonary nodules.

It may be claimed, however, that one attack of glanders does not confer immunity, and that those cases in which symptoms recur after a long period of apparent cure may be merely examples of a second infection. It is very difficult to absolutely disprove this in the majority of cases, perhaps, but Babès quotes one very interesting case (139) in which there appears to have been no opportunity of re-infection. It seems clear from this case that in man the disease may be latent for years and then break out afresh without the patient's having again come in contact with glanders. A groom in charge of a glandered horse developed pleurisy, from which he recovered. He left his former occupation and acted as ox-herd in a region where there were no horses. Over five years later, during which time he had never come in contact with horses, he developed a series of abscesses from which he died a few months later, and the bacillus mallei was shown to be present in the lesions at autopsy.

An examination of the present series shows that periods of remission and latency were present during the course of the disease in a number of cases. In Travers' second case (4) the old healed lesions broke down again six weeks after the patient had returned to work. Wade's patient (13) was perfectly well for three weeks after his recovery from the lymphangitis and adenitis which ushered in the disease. Banks's case (51) was discharged from hospital only to be re-admitted four months later. De la Garde and Clapp's case (58) remained free from lesions for three months. In Williams and Taylor's case (54) a slight transient rash appeared after the healing—this was prompt—of an abrasion received while caring for a glandered horse; the patient was then free from all symptoms for over two months. In one of Tardieu's cases (36) all the abscesses healed and the patient thought he was cured, but a fresh outbreak of the disease occurred. Cooper's case (94) became well enough to resume work for several months, then the disease broke out afresh. In Kernig's case (95) a period of remission lasting two months was noted. Old cicatrices on the front of the leg of a soldier, who had long had no dealings with glandered horses, broke down following traumatism and the bacillus mallei was isolated from the ulcers (Babès' 2nd case (121)). Churton's case (99) had an attack of supposed typhoid followed by the development of two nodules on the leg, after which he was well for three months before further symptoms appeared. Hallopeau and Jeanselme's case (105) after running a course of two years was free from symptoms for three years before the fatal recurrence took place. In von Baracz's case (139), a nine year's course was succeeded by a remission of nearly five years before the eventually fatal recurrence. In Babès's case above quoted (120) the period of latency was over five

years. The leg ulcer, which was the first lesion in Zieler's second case (145), had been healed for eight months before other manifestations appeared. In the third case reported by Zieler (146), supposed cure was followed by a fresh outbreak, and two years after these latter lesions had disappeared, repeated causeless rises of temperature were noticed that may not improbably be put down to renewed activity of the same disease. In our own case reference has been made to the probability that the glanders really began two years before the onset of the illness during which he was under our care for 20 months, and during 18 months of this time there was complete latency.

A careful examination of our series suggests not only that glanders may be latent for a considerable period during the course of the disease, but also that latency may occur at its very onset. In two or three of the cases above quoted a single lesion was followed by a considerable period of quiescence. Williams and Taylor's case (54) is a good example of how trifling this lesion may be. In other cases no history can be obtained of any lesion occurring at or near the time during which the contact with glanders existed. Whether or not some slight lesion existed at the time of contact with glanders, unnoticed or forgotten by the patient, is a question immaterial to our present consideration. All that here concerns us is the fact that in at least three cases of our series contact with glanders was admitted, but this contact had completely ceased a considerable time before any definite manifestations occurred in the patient. This interval, during which there was no ascertainable contact with glanders, and which preceded the apparent onset of the disease, was in Auer's first case (87) several months, two years in Neisser's (108) and 12 years in Hallopeau and Jeanselme's case (105). Of course it may be said that the disease was contracted in some other way, and such a statement cannot be disproved, but if it be admitted that infection probably took place from the known source of contagion, it seems a more rational explanation of such cases to suppose that they are cases of glanders latent at the onset than to assume that the period of incubation in human glanders, which in the majority of cases is only a few days, may be prolonged to many months or even years.

There is reason to think that the more carefully the history and the subsequent course of cases of human glanders are investigated, the more common will cases of latency prove to be.

Diagnosis. A history of relations with glandered horses or with a previous case of human glanders, or of laboratory experiments with the bacillus mallei, is to be obtained in the great majority of cases of glanders which are carefully investigated. Any wound infection or lymphangitis occurring in a person with such a history is to be regarded as extremely suspicious and the diagnosis should be made absolute by immediate inoculation of animals and by cultural experiments. The appearance of the nasal discharge or of abscesses at a distance would increase the probability of glanders in such a case.

A partial list of the mistakes in diagnosis made for a time at least

in the cases comprising this series may be of interest.* The probable or definite diagnosis wrongly made, was:—

Syphilis	5 times	Tuberculosis	2 times.
Scrofulous eczema	1 "	Typhoid	4 "
Typhus	1 "	Rheumatism	5 "
Cadaveric poisoning	3 "	Ague	2 "
Pernicious anæmia	1 "	Sarcoma of tonsil	1 "
Nasal polyp	1 "		

In cases with no focal symptoms where there is an acute febrile onset with step like rise of temperature, headache, pains in the limbs, weakness, and splenic enlargement, the resemblance to typhoid fever may be so close that nothing but time with a careful investigation of the history of the case will clear up the diagnosis. The continued absence of the Widal reaction and of typical rose spots† will throw doubt on the diagnosis of typhoid, and the appearance of swellings on the extremities will point in the right direction. It is not, however, common for chronic glanders to simulate typhoid for more than a few days.

Where repeated chills and sweating are prominent features, pyæmia will be suspected. Due attention to the history of the case, a careful observation of its course, and the utilization of any foci which may develop for cultural and animal experiments, will probably eventually clear up the diagnosis.

A search for the plasmodium malariæ in the blood will exclude malaria, when it is suspected from the occurrence of rigors and sweating.

When with an acute febrile onset, pains in the limbs and joints are severe, acute rheumatism will be thought of, but signs of inflammation in several joints are rare at the onset of chronic glanders. Besides, as a rule, though not invariably, glanderous involvement of a joint soon goes on to suppuration and there are usually subcutaneous and intramuscular foci.

In syphilis and tuberculosis the previous history is different. Apart from this, the whole symptomatology must be carefully considered and in the case of tuberculosis the specific germ must be sought for. In many cases cultural and inoculation experiments will be necessary to make the diagnosis certain. Glanders will be compared with other diseases of the infective granulomatous type at the close of the section on diagnosis.

ANIMAL INOCULATION. Two species of animals are of especial use for inoculation experiments, donkeys and male guinea-pigs. DONKEYS are very susceptible to glanders. The hair, usually over the forehead, is cut short, the skin scarified and some of the suspected discharge rubbed well into the wound. If the disease in question is glanders the animal develops acute glanders and dies in less than two weeks‡.

*A probably wrong diagnosis of tuberculosis was made in several other cases not here included.

†In rare cases spots indistinguishable from rose-spots seem to have occurred

‡Exceptions to this statement are so rare that for practical purposes they may be neglected.

GUINEAPIGS. Straus injected some of the suspected material intraperitoneally into male guineapigs, and found that in glanders an inflammatory swelling of the testicles, or, speaking more accurately, of their tunicæ vaginales, developed in two or three days, the animal dying in 4 to 15 days. Between the layers of the tunica vaginalis is found a layer of dry cheesy pus which contains the bacilli in abundance and may be used for cultural purposes. If there is mixed infection, however, intraperitoneal injection is apt to be followed by rapid septicæmia and death before the characteristic swelling of the testicles has time to develop. Where mixed infection is suspected, it is better to inoculate also a second animal by subcutaneous injection. The neighboring glands become swollen and one of them may be excised for cultural experiments and intraperitoneal inoculation of another guineapig.

For the diagnosis of glanders in man it appears that Straus's procedure when positive is practically pathognomonic. One rare exception in the horse may be noticed. Nocard found bacilli in certain forms of suppurative lymphangitis occasionally met with in the limbs of the horse which caused the same testicular swellings in guineapigs, but these bacilli, unlike the bacillus mallei, are positive to Gram's stain and do not give the characteristic growth on potato which the glanders germ does.

It must be pointed out however in this connection that though a positive result with Straus's procedure is quite conclusive, the converse by no means holds good. It is no more justifiable to exclude glanders because the first inoculation of male guineapigs fails to produce the characteristic orchitis than it would be to affirm that a person had no pulmonary tuberculosis because a single examination of the sputum failed to reveal tubercle bacilli. The bacilli in glanders lesions, and particularly in chronic lesions, are apt to be very scanty, and there is every probability that a certain number of bacilli, a variable number, it is true, but still not inconsiderable, are necessary to produce glanders or any other disease in experimental animals. In our own case the findings in the first guineapig used were quite negative. Another source of error is the very limited period for which the animals inoculated are usually kept under observation. In most cases observation for a week or ten days is considered ample, yet in von Baracz's case (139) typical manifestations in the testicles of the guineapig appeared seven weeks after inoculation. In von Strube's case(129) swelling of the testicles followed the injection of cultures from the human patient's nasal secretion, but no ulceration of or nodules in the testicles were present. In the same case material from a nodule on the thigh proved negative, yet at autopsy a typical growth on potato was obtained from the lesions, cocci being also present.

Nor can definite conclusions be drawn from negative CULTURAL FINDINGS, unless these are frequently repeated. In one of Bal[illegible]'s cases (136) cultures on agar and serum were negative, but ev[illegible]ually a scanty typical growth on potato was obtained. It has been claimed that such failures show that the bacteriological technique was faulty, but Loeffler himself had difficulty in isolating the B. Mallei from the lesions in Kernig's case (95), owing to the scantiness of the germs. In

Jakowski's case (101) the first cultures, made from skin lesions, showed nothing but staphylococci, but later cultures from a muscular focus and from the testicle showed B. Mallei in pure culture. In Mader's case(112) no glanders bacilli were shown in the fluid from the knee joint, but later they were clearly demonstrated by Weiselselbaum in skin lesions on the legs.

Of cultural methods the characteristic growth on potato will alone be referred to. Fresh potato sterilized and inoculated with glanders bacilli and incubated at 37° C. develops on its blackish grey surface whitish grey elevations which turn honey yellow, and finally of a chocolate color. It requires the development of the chocolate color to be characteristic. No other germ known produces this succession of events.

A bacillus which produces swelling of the testicles when inoculated intraperitoneally in a male guineapig and which produces a honey-colored growth, finally of chocolate color, on potato, may be identified as the B. Mallei without hesitation. The combination of these two characteristics is absolutely pathognomonic, so far as is known.

In at least 28 cases of this series guineapigs were inoculated from the lesions, every time with ultimate positive results, though the first attempt was not always successful. Donkeys were used five times always with positive results. Horses were used seven times; four times they developed glanders, in the other three, glanders was denied, but the horses died. As in one of the successful inoculations there were no clinical signs of glanders in the horse during life, though typical lesions were found at autopsy, and no autopsy was done in two of these three inconclusive cases, it seems probable that the grounds on which glanders was denied were insufficient. Field mice were used once with positive results. Rabbits and sheep were employed in one case with negative findings. A female dog proved refractory, but in another case typical nodules were produced by intravenous injections into a dog. Once bacillary toxins were injected into an animal and caused its death without the production of any lesions of glanders. A cat was inoculated with negative results in one case. In another case three kittens inoculated became emaciated and one had discharge from the eyes, the mother cat developing snuffles.

BACTERIOLOGICAL INVESTIGATIONS were made in 48 cases of the present series. In 26 of these, cultures made from the lesions or discharges during life showed characteristic glanders bacilli, in pure culture or mixed with other organisms, usually cocci, and in 7 other cases the bacilli were cultivated from the lesions of guineapigs experimentally inoculated. Seven times coverslip preparations of the pus made during life showed bacilli of some sort—once 'rods', twice bacilli resembling those of tuberculosis, three times bacilli like those of glanders and once colon-like bacilli. Once bacilli were shown microscopically in sections of a nodule which developed at the site of an abrasion while a physician was doing experimental work on glanders, but, perhaps owing to the rigid antisepsis employed when the nodule was excised, cultures remained sterile.

More than once repeated blood cultures were negative. In three cases it is stated that no bacteria could be shown in the discharges during life. In one of these, coverslip preparations from the foci in the internal organs at autopsy showed the bacilli, though similar preparations from the external foci during life showed no bacteria. The bacilli were found, apparently for the first time, culturally at autopsy in 10 cases.

MALLEIN. In 1891 two Russian veterinarians, Helman and Kalning, by repeated sterilization and filtration of a culture of B. Mallei, prepared a clear liquid called by them mallein, analogous to tuberculin, with which they proceeded to experiment, to see whether it would prove of the same value in the diagnosis of glanders as tuberculin had been shown to be in tuberculosis. It was found by them that a definite series of events, technically called a 'reaction', occurred when mallein was injected into a horse with glanders, but was wanting when non-glandered horses were injected. This reaction was found to be so constant as to form a reliable way of diagnosing the disease, and the method of preparing mallein was improved so that the product of a given firm is of fairly constant strength.

WHAT CONSTITUTES A REACTION. — The animal to be tested has its temperature taken at intervals for a day or two before the test. The skin being shaved and disinfected over the area to be utilized, the injection is made hypodermically. The dose necessary varies with the product used. In a glandered horse an inflammatory tumor begins to form a few hours later at the site of injection. This tumor keeps increasing in size for 24 to 36 hours, persists for two or three days and does not entirely disappear for five or six days. It often interferes with the movement of the limb injected. This is known as the LOCAL REACTION, which is even more important for diagnostic purposes than the fever. With the appearance of the tumor the animal is markedly prostrated. It has chills and muscular trembling; however fractious naturally, it becomes perfectly docile and spiritless; its appetite fails and its coat is dull and bristling. Eight hours after the injection the temperature is decidedly elevated and reaches its maximum (1.5° to 2.5° C. above normal) 10 to 12, or even 15 to 18 hours after the injection. This constitutes the GENERAL REACTION. If an animal shows the local and general reaction above described, it is certainly glandered and should be destroyed.

An animal which is not glandered shows at the point of injection nothing more than a slight œdema, which subsides in a few hours. Generally there is no fever. There are a few other conditions in the horse in which the injection of mallein may cause some rise of temperature, but this lasts but a few hours and the prostration shown by the glandered animal is not present in any marked degree. An animal which shows no local reaction and no constitutional reaction and no fever after being injected with a sufficient dose of a reliable mallein for the first time is not glandered, however strongly the clinical signs may point to glanders, unless the disease is far advanced. In such cases, as with tuberulin in advanced tuberculosis, the reaction is apt to fail completely.

Generally the result of one mallein injection is quite conclusive,

but if the results are doubtful the injection should be repeated a month later, the animal being isolated during the interval

Bonome in 1893 was pioneer in the use of mallein in human glanders. His results show the identity of the reaction in man and in horses. After his patient's temperature had been observed to be normal for several days, 3 minims of mallein were injected hypodermically; five hours later there was a severe chill, the temperature reaching a maximum of 39.8° C. in 12 hours, pulse 100 respirations 40. Nasal breathing was difficult and there was profuse sweating. Two days later 2 minims were injected, but no reaction followed. After two days more, 4 minims produced in addition to the febrile reaction slight swelling and pain in the injected area. And repeatedly this local action was noticed to follow subsequent injections, even of smaller quantity.

In spite of the improvement shown by Bonome's patient under this treatment, mallein has not come into general use as a means of diagnosis, and perhaps conservatism in this matter is wise. It had been repeatedly observed that too free injection of tuberculin in the tuberculous patients appeared in certain cases to influence a quiescent trouble and make its course much more rapid. The analogy of mallein to tuberculin suggests that in glanders mallein might have a similar bad effect. We shall refer to this again when discussing the curative use of mallein.

Harm to the patient from the injection of mallein may be rare, but the bare possibility of such an occurrence enjoins the greatest caution in its use in man, though in horses, which are tested only to be destroyed when diseased, such a consideration would have no weight. As is the custom now-a-days with tuberculosis in man, we would suggest that it is advisable to begin with minimal doses, gradually increased.

AGGLUTINATION and SEDIMENTATION, though as yet they appear to have but little practical value, deserve brief mention.

On the publication of Widal's method of diagnosis in typhoid, McFadyean endeavored to apply the same principle to the diagnosis of glanders. To one volume of blood he added nine volumes of sterilized bouillon containing a rich culture of glanders bacilli that had been grown for three days on agar at 37° C. In glandered horses there was clumping in an hour, more marked after two hours. Of two normal controls one showed no clumping, the other a much slighter degree than occurred in the glandered cases.

Simultaneously, Wladimiroff at St. Petersburg conducted an elaborate series of experiments along similar lines. In addition to McFadyean's method he employed two others, (i) mixing the serum to be tested with cultures of glanders bacilli grown directly on bouillon; (ii) mixing bouillon and the serum to be tested in various proportions, sterilizing this and using it as a culture medium for the bacillus mallei. This last method gave the best results, but it is slow and the procedure too complicated for ordinary clinical purposes. While in ordinary culture media growth of the glanders bacilli occurs uniformly, in the mixed bouillon and serum the bacilli grow in clumps, giving a somewhat granular appearance to the

liquid. The size of the granules depends upon the activity of the serum used and the dilution in which it is present. The more potent the serum and the less the dilution, the coarser are the granules, and vice versa. Gradually these granules deposit, forming a flocculent sediment. In ordinary glanders cultures there is much less deposit and it is more viscous. The liquid, which has become considerably clarified by this sedimentation, again becomes turbid and bacilli are much more abundant in it than in ordinary cultures. The smaller the number of bacilli with which the culture is inoculated, the more distinct is the reaction. The clumped bacilli are so distorted as to be almost unrecognizable.

The serum of non-glandered horses gave results in dilutions of $\frac{1}{250}$ and $\frac{1}{500}$, but in glandered horses a dilution of $\frac{1}{16000}$ gave positive results.

Heanley (Lancet, Feb. 6th, 1904), apparently using McFadyean's method, found in a human case of six months standing that slow clumping occurred in a dilution of $\frac{1}{5}$, but after two and a half hours more bacilli were free than clumped, while the serum of a diphtheritic patient caused almost complete clumping in twenty minutes. In a case of glanders of 13 months standing the specimens could not be distinguished from the controls. As the bacilli used had lost most of their virulence by being grown saprophytically for some months, too much stress should not be laid upon these results as showing the agglutination reaction to be unreliable. One part of Heanley's results deserves notice. Diluting one part of serum from a glanders patient with 109 volumes of salt solution, he mixed this with an equal quantity (110 volumes) of an emulsion of the bacillus mallei in salt solution. Sedimentation of the bacilli occurred in ten hours in this specimen, not present in controls. A dilution of $\frac{1}{11000}$ showed sedimentation, generally distinguishable in six hours. He concludes that this method for purposes of diagnosis is decidedly more reliable than the microscopic method of studying agglutination. Many observers who have tested both methods point out similarly the greater sureness of the macroscopic method with Typhoid serums*.

Similarity of Glanders to other infective Granulomata. It may be of interest to consider the analogy of glanders to other members of the family of infective granulomata, particularly tuberculosis and syphilis.

The polymorphism of the symptomatology of tuberculosis and of syphilis has long caused them to be considered our best examples of protean disease. A study of this series of cases has thoroughly convinced the writer that glanders is not a whit behind syphilis and tuberculosis in the variability of its symptomatology. It is candidly admitted by the highest authorities that the ulcerations of the skin and mucous membranes in glanders are in many cases indistinguishable from lesions produced by syphilis or tuberculosis. Glanderous cold abscesses are by no means uncommon, and the scantiness of bacteria in their contents is an additional point of resemblance to tubercular cold abscesses. Other subcutaneous lesions occurring in

*Vide Klotz O. On agglutination methods. J. Am. Med. Ass., April 1905.

glanders are practically identical with gummata. Glanders and syphilis are both fond of attacking and destroying the bones, particularly the bones of the head and face. Glanderous osteomyelitis is analogous to tuberculous osteomyelitis, and there may be a close resemblance between tuberculous and glanderous joint affections.

The many different eruptions of syphilis have their analogue in the variety of the rash of glanders. In one case (Gourfein, Marignac and Vallette (131)) a definite diagnosis of tuberculosis of the lacrymal sac was made. To absolutely prove the diagnosis guinea-pigs were inoculated and it was found that the disease was glanders. Like syphilis, glanders shows a strong tendency to destroy the nasal bones. Slow, stubborn ulcers in the month may occur in all three diseases, in all of which laryngeal ulceration is also common. Bacteriological examination is necessary to distinguish absolutely between pulmonary tuberculosis and pulmonary glanders, and syphilis too may attack the lungs. Pleurisy is almost as common in pulmonary glanders as it is in pulmonary tuberculosis, and apparently a glanderous, as well as a tubercular empyema may occur. Glanders of the stomach seems to be as rare as tuberculosis or syphilis of the stomach, though cases of all three are on record. Ulceration of the bowel, of common occurrence in tuberculosis, may occur, though rarely, in glanders. Tubercular peritonitis is common; there are suggestions in the cases of this series that glanderous peritonitis may occur.

Intracranial lesions are common in all three diseases. Leptomeningitis is less common in glanders, but may occur, though rarely generalized. Localized extradural collections of thick, fibrinous, purulent material are common to glanders and syphilis. Tuberculomata in the brain have their analogue in the foci that may develop in the brain substance in glanders.

Tubercular and glanderous foci may occur in the kidneys, and syphilis too attacks the kidney at times, though in a different way. All three diseases may affect the testicles, though here again the resemblance between glanders and tubercular disease is most marked. The female genitals may also be attacked by syphilis, tuberculosis and glanders alike. The two cases of primary vaginitis in glanders are especially interesting, inasmuch as the virus of syphilis usually gains entrance in this way, and primary tuberculosis of the female genitals may also occur. Foci in the liver and spleen may occur in all three diseases.

We see from these remarks that there is hardly an organ or tissue in the body that may not be attacked by any one of these three diseases.

The initial lesion of glanders may be likened to the primary sore in syphilis, the skin eruption in glanders to the secondary rashes, and the glanderous foci in the muscles, bones and internal organs to the tertiary lesions of syphilis. The objection may be made that in glanders tertiaries often precede the secondaries; but it seems to be the opinion of most authorities at present that syphilitic tertiaries are not necessarily the late development in point of time that we were

onee led to eonsider them*. The writer has knowledge of at least one ease of syphilis in whieh definite signs of intracranial syphilis appeared while the primary sore was still present. They were shrewd observers who a century ago held that syphilis in man was the same disease as glanders in the horse!

All three diseases are insidious and treacherous. At times we are led to eonsider that they are eonquered and later we find that they have only relaxed their hold in one plaee to take fresh grip of another and perhaps more vital part. All these diseases are subjeet to prolonged periods of latency, extending perhaps to several years, during which time there are no signs of aetive disease. These periods of quiesceneе, which are apt to be regarded as definite eures, are liable to be followed by fresh outbreaks of the disease, whether it be glanders, syphilis or tubereulosis. The outlook is perhaps more gloomy in glanders than in either of the other diseases, and yet in one or two eases of this series the records seem to show that it is possible for a patient with glanders to go nearer death than a patient that has either tubereulosis or syphilis, and still reeover.

The virulence is subject to wide variations in all these diseases. One or two pathologieal resemblanees may be briefly notieed. The essential lesions in all three eases seem to be associated with the presenee of the infeetive agent itself and not due solely to toxins, and in each ease the virulenee in old lesions tends to die out. The bacillus of tubereulosis morphologieally resembles the bacillus mallei. The lesions in all three diseases show a combination in varying proportions of neoplastic formation with tissue destruetion and suppuration. So elosely do the lesions of glanders, tubereulosis and syphilis resemble one another under the mieroseope that it may be doubted whether a eareful pathologist would be willing in all eases to make a definite diagnosis as to which disease was present from the mieroseopie appearanees alone. In our own ease a fibrinous perihepatitis and perisplenitis were present which were quite indistinguishable from similar lesions occurring in syphilis. The large granulomatous mass compressing the brain in the same ease was scaree distinguishable from a gumma.

Tubereulosis, syphilis and glanders when ehronie are all liable to eause amyloid disease.

Finally, it may be noticed that two, and not improbably all of these diseases may co-exist in the same person. In Hertel's ease the bacilli of both tubereulosis and glanders were demonstrated, and this ease is not unique in the literature. Kernig's ease had syphilis as well as ehronie glanders. Other eases of what was quite possibly a double infeetion occurred in this series, but they were not proven definitely to be sueh. The coincidence of syphilis and tubereulosis in the same person is not uncommon.

A brief comparison of points of resemblance between glanders and leprosy may be made, though the matter is of more scientifie than practical interest. The morphological resemblance of the two bacilli is noticeable. Skin lesions oeeur in both and in both may eome in

*Vide Adami. Syphilis and the Liver, N. Y. Med. Journ. 1899, II, 549.

successive crops. The appearance of nodules which may ulcerate and the ulcers refuse to heal, the affection of the eyes, nasal mucosa, larynx; the tendency to involvement of bones and joints, to general infiltration of the skin and underlying parts, and to gangrene,—all these features are common to leprosy and glanders. Over 20% of all cases of leprosy are said to die of tuberculosis.

Finally, all these four diseases are widely distributed over the face of the earth, and are not confined to any one climate or nationality.

Nevertheless, while admitting the many resemblances of glanders to other diseases of the same class, we must point out the fact that glanders has certain features which serve to differentiate it more or less clearly from these other diseases. There is no need to go into this matter exhaustively, but it may be pointed out that subcutaneous and intramuscular foci which go on to definite abscess formation are vastly more common in glanders than in the other infective granulomata, and that the pulmonary manifestations of glanders are more apt to escape notice than is pulmonary involvement occurring in these other diseases.

Prognosis. As regards the acute form of the disease, all authorities are agreed that the prognosis is very unfavorable. Only a very small proportion of such cases recover. But as to the curability of chronic glanders very erroneous ideas prevail. The course of the disease may be very long, and it is subject to intermissions during which the patient may regain strength and vigor in considerable degree and all the lesions may disappear. These periods of apparent freedom from the disease not infrequently last months, indeed periods of three years (once) and five years (twice) of freedom from symptoms have been reported among the cases collected here, in men who finally died of glanders. Most cases of so called 'cured' glanders are reported soon after the patient becomes free from symptoms. Indeed, not rarely cases that have been considered practically cured have been reported while the disease was still actively going on. It is obvious that a percentage of cures based upon a consideration of such cases must be most fallacious and it is strange that these statistics should have been compiled, or accepted, by such high authorities as Bollinger*, who states that the mortality of chronic glanders is only 50%, and Woodhead†, who estimates the death rate to be as low as 40%. Councilman‡ too states that a large percentage of cases of chronic glanders recover independently of treatment. If we only insist that a patient must be statedly free from symptoms for over a year to be considered cured—and we have seen that an exemption of five years may precede a fatal termination—we find among the 156 cases here analyzed less than 6% of proved cures This estimate is doubtless too low, but it is probably much nearer the truth than the figures of Bollinger and Woodhead.

In general the outlook is best in cases in which a very early diagnosis is made and the successive lesions as they appear are vigorously

*Ziemssen's Cyclopedia of the Practice of Medicine, article Glanders.

†Allbutt's System of Medicine, article Glanders.

‡Reference Handbook of the Medical Sciences, article Glanders.

attacked in the most radical surgical fashion. Twenty operations under general anæsthesia in two and a half years, most of them to attempt the radical extirpation of one or more foci, was the record in Holmes's case; the result was a permanent cure.

When the poison has gained access through an abrasion on one of the extremities and remains localized in this limb for some time, as sometimes happens, the opportunity for favorable results from radical treatment would seem to be good, but unfortunately such cases are generally regarded as the result of ordinary wound infection by the pyogenic organisms, and invaluable time is lost before a diagnosis is made.

Symptoms pointing to a rapid generalization of the virus, such as frequent chills and sweating, involvement of the several mucous membranes and internal organs, or a generalized eruption, suggest an approaching lethal termination. Still it is astonishing how near to death a patient may come and recover, probably permanently. Cooper's patient (94) after a year's illness was so low that death was looked for daily, when she rallied, recovered, and had remained free from signs of disease for some months when the case was reported.

Curability. 40 of these 156 cases were considered cured when they were reported. But in a disease which may present such long periods of complete remission as glanders, it is a very difficult question to decide when any case can be considered as definitely cured. In the present series a remission of three years occurred in one case and of five years in two others, and yet all these cases ultimately died of glanders. Under these circumstances it is obvious that we cannot include as definite cures cases that had only just become free from symptoms when reported. The erroneous opinion generally prevailing as to the curability of chronic glanders is partly due to a failure to take account of the tendency in glanders to long periods of complete quiescence, in making statistics, and partly also, it is feared, to a careless inclusion as "cures" of cases that were 'in a fair way to lose all traces of the disease' or were 'expected to be fully recovered in a short time.'

If we were to insist that a case must be free from symptoms for five years before it can be considered definitely cured, we would find only two definitely proved cures among the 156 cases. Bouley(31) lived 45 years after recovery and Lesur's case (71) was well 12 years after manifestations of the disease ceased. Even if we are much more lenient, as we propose to be, and only insist on freedom from symptoms for a full year or over, without any known return of the disease later on, only 9 of the 156 cases can be regarded as DEFINITE CURES. In addition to the two cases already mentioned, we have Monneret's 1st case (38), Bourdon (65), Bertin (69), Gold's 1st case (100), Holmes (113), Buschke (126) and Jenckel (143), definitely cured. Of these cases the lesions in Buschke's and Jenekel's cases were confined to one arm, in Bertin's the lesions mentioned were but few, and in the remaining cases there were more or less generalized abscesses, in Gold's case with bronchitis as well. It is worthy of remark that nasal or buccal involvement apparently did not occur in any of the cases that were definitely cured.

Cases that remained well from several (5) months to a year after their apparent recovery are classed as PROBABLE CURES. This list includes eight cases, viz: Cazin (62), Cooper (94), Jakowski (101), Gold's second case (107), Pepper (109), Nicolle and Dubos (141), Zieler's third case (146)* and Stuart (147). Of these, Pepper's case had but one focus, which was immediately excised. In Cazin's case, Jakowski's, Nicolle and Dubos's, and Stuart's, abscesses were almost the only objective manifestations of the disease. Besides abscesses, in the other three cases there were additional signs. Gold's second case had diarrhœa and bronchitis; Cooper's case had vaginitis, necrosis of the hard palate, otitis media, and almost total destruction of one eye; Zieler's third case had nasal and laryngeal catarrh, necrosis in the fibula and the frontal bone, and localized purulent pachymeningitis. It is readily seen from an examination of these last cases that extensive disease does not necessarily prevent recovery, probably permanent recovery. A tabular statement of the results in these cases is given below:—

Stated cure	Possible	23
	Probable	8
	Definite	9
Incomplete cases		24
Result not stated or dead of other diseases		3
Died		89

That is to say, of these 156 unselected chronic cases, less than 6% were definitely cured, 5% were probably cured and 15 % possibly cured; 15% were incomplete and 57 % were dead when the case was reported, the result being unstated in 2%.

If we omit the cases that were not free from symptoms when reported or in which the result was not stated, and include only cases which either become free from symptoms (40 cases) or died (89 cases), we find among these about 7% of definite cures, 6% of probable cures, 18 % of possible cures, and 69% of fatal terminations.

Doubtless this division of so-called Cures into Definite, Probable and Possible is inaccurate, for it is altogether likely that some of the cases here included as probable and possible cures became definite in time and that some of the incomplete cases also ultimately recovered; but it is considered that the percentage of definite cures obtained by an analysis of these cases, 6%, is very much nearer the actual percentage of permanent recoveries from chronic glanders than the figures given by Bollinger and Woodhead. There is even a possibility that not all the cases here included as definite cures were really permanent, for we have only insisted on freedom from symptoms for a full year, whereas two of the fatal cases in this series remained free from symptoms for five years.

---

* Zieler's case is only regarded as a probable cure, because two years after apparent recovery there were repeated causeless rises of temperature which were not improbably due to the same disease.

Treatment. PROPHYLAXIS. As Wherry of the United States Biological Laboratories says in his article on the diagnosis and prevention of glanders, there is probably less excuse for the existence of glanders among our domestic animals than any other disease, so certain is mallein as a means of diagnosis and so readily can existing foci of disease be stamped out. For practical purposes the suppression of glanders among the equidæ would mean its entire disappearance as a human disease. A very common way of spreading the disease among horses is through the use of public watering troughs by glandered horses. All horses suspected of having glanders should be promptly tested with mallein. Where the reaction is inconclusive, these animals should be kept rigidly isolated in a stable by themselves and tested again at intervals of one or two months. Should such animals develop clinical signs of glanders they should be destroyed immediately. According to Nocard, a latent reactor when it has twice successively failed to react, may be considered cured, but the extensive experience of Dr. Rutherford, Veterinary Inspector General for Canada, who kept track of all latent reactors and all ceased reactors in Canada for a period of three years, absolutely disproves Nocard's theory. Numerous outbreaks of equine glanders in Canada have been traced to the ceased reactors which Nocard considers cured.

Grooms and others who have the care of such suspects should be warned of the danger of carelessness and told to handle the animals as little as possible. They should be warned particularly of the danger of trifling wounds and of the need of protecting existing abrasions by bandaging and antiseptic measures. The attendants should thoroughly wash their faces and hands each time after caring for the suspected animals. Suspicious wounds in such attendants should be promptly and energetically dealt with, preferably by excision, followed by the application of pure carbolic acid or the thermocautery. Human beings should never be permitted to sleep in stables where there are suspected cases of glanders.

With due care there is not much danger of contracting the disease, but in a disease so exceedingly fatal as human glanders every precaution should be taken.

A method providing for at least partial compensation by the Government for animals destroyed on account of glanders is in existence in some countries and would be of the greatest assistance in stamping out the disease if adopted universally. The horses affected are destroyed mainly for the protection of the community. Why then should the unfortunate owner have to bear the whole loss? The adoption of such a system would ensure prompt notification to the authorities of suspicious cases. As illustrative of this, it may be noted that such a system of compensation was adopted by the Canadian Government a year ago, with the result that during the year just closed four times as many cases of glanders were dealt with by the authorities as during any previous year. Other Governments would do well to follow the example set by the Dominion in adopting this wise and far-sighted policy.

When glanders has occurred in a stable, the yards, stable, harness and whatever else has been in contact with the infected animals should

be thoroughly disinfected after the horses affected have been destroyed. For stables and yards this is most effectively done by the 'cyclone burner', by which oil is pumped through a hose and ignited at a metal nozzle, the fiery spray being passed over the surfaces to be disinfected. A preliminary thorough wetting of the surfaces to be disinfected both does away with the danger of fire and increases the efficiency of the disinfection. For use in buildings the cyclone burner should always be in charge of a man thoroughly accustomed to its use. Harness should have all dirt removed from it, and be thoroughly scrubbed with soap and water, then with creolin solution, or $\frac{1}{10}$ carbolic. Washing with $\frac{1}{10}$ carbolic lime-wash after removing all dirt and grease and tearing out and burning the mangers may be used to disinfect stables.

The bodies of animals that have died of glanders are best cremated. If this cannot be done, they should be buried deeply, preferably with large quantities of disinfectants.

Great care should be taken by those in attendance upon a case of human glanders, since it seems certain that human glanders is much more likely to convey the disease to man than equine glanders. This is simply one example of the general law that the passage of an infection through an animal of any species is apt to increase its virulence for that species. The urine and fæces are not usually a source of danger, but all dressings should be promptly burnt and bedclothes and garments liable to be soiled by the discharges should be disinfected, preferably by boiling, before being washed. Absolute cleanliness is the key to safety. Where there are nasal, mouth or throat lesions, the patient should have separate dishes, scalded each time they are washed, and a thermometer should be kept for his exclusive use. Those who dress the wounds should carefully disinfect their hands after each dressing. Instruments, etc., used in doing the dressings should be cleansed and boiled each time after use. The patient should sleep alone, as several cases are on record where the disease was communicated from husband to wife. All unnecessary contact with the patient should be avoided.

With the above precautions it is doubtful whether rigid isolation of the patient is invariably necessary, though Koranyi recommends this. But where the discharges are profuse and where the patient is delirious or persistently uncleanly in his habits, isolation is advisable. Similar precautions should be taken by all who are doing experimental work on glanders. The list of those who have fallen a prey to this disease in the course of their scientific investigations is a lamentably long one, and this loss of life is generally due to neglect on the part of the victims to take precautions which they well knew to be necessary.

IMMUNITY. It was found that by the passage of the virus through a series of animals the virulence of the bacillus mallei could be increased or diminished. And bacilli long grown saprophytically lose much of their virulence. The repeated intravenous injection of small numbers of bacilli, particularly old cultures, in the dog, causes it to develop a general immunity through which it is enabled to resist the intravenous injection of the germs in such numbers as would be fatal to another animal. There is, however, no local immunity, for a chancre still follows local inoculation of the germ. And the general immunity so

produced is but short lived. Sacharoff, passing the germ through a series of cats, obtained a virus which was more active for cats, but which gave to horses a mild form of the disease, which was followed by immunity. It is not, however, stated how long this immunity persisted.

The immunity of cattle from glanders suggested the injection of their serum as a means of attempting to confer immunity, and the production of immunity in colts, and even the cure of the disease in guineapigs has been claimed as a result of such injections. Bonome claims that when bovine serum is left long in contact with the bacillus mallei, its power of destroying the bacilli is increased and that it then has curative properties in certain animals (guineapigs). The brilliant results obtained by serum therapy in other fields lead to the hope that a similar method of treatment may be developed which will give good results in human glanders. Both of the cases in our series that were treated with bovine serum recovered, temporarily at least.

It may be well to recollect, however, that attempts to use the serum of animals naturally immune as a form of treatment in other diseases have not been attended with great success, and that this form of treatment has not as yet had any extensive trial in human glanders.

Attempts at immunisation in man are as a rule unjustifiable. It is certain from numerous animal experiments that mallein has no immunising properties.

GENERAL MANAGEMENT, HYGIENE AND DIET. The patient, if not continuously kept in bed, should remain perfectly quiet while the disease is active, for exertion has in some cases (Travers' 2nd (4), Stuart (147), Robins and Bell (155)), seemed to aggravate the disease. For the same reason cold is to be avoided (Ludiche (37) and Robins and Bell (155)). Hygienic conditions should be of the best. The patient should have a light airy room, frequent changes of clothing, and frequent bathing. Cazin's patient (62) began to mend promptly after an improvement in his hygienic surroundings. The diet should be liberal, and in chronic glanders both appetite and digestion are commonly good. Stimulants have often been added with good effect.

MEDICINAL TREATMENT. Most of those who have had the largest experience with glanders seem convinced that drugs given internally have no effect on the disease. Koranyi never saw benefit from the administration of any drug. Perhaps general tonic measures may do some good, but the evidence of benefit from their use is not strong. Iodide of potassium, ammonium carbonate, aconite in large doses, strychnine, arsenic, quinine and iron are among the remedies that have been recommended.

MALLEIN, when injected repeatedly, is very generally considered to be curative in horses. It is indubitable that a large proportion of glandered horses so treated lose their power of reacting to mallein and often all clinical signs disappear. But Dr. Rutherford has always been rather sceptical as to the curative power of mallein, and careful observation of all ceased reactors in Canada has enabled him to clearly trace several outbreaks of glanders to this source. Notwithstanding, the fact remains that horses treated by mallein often show wonderful clinical improvement, and analogy suggests that its use in human

glanders might be beneficial, but as yet there are no sufficient data to enable us to affirm that improvement generally follows the use of mallein in man. This was the case in Bonome's patient (119), but unfortunately the boy passed from observation before his symptoms had disappeared, and subsequent history of the case is wanting.

It is probable that mallein, like tuberculin in tuberculosis, tends if used indiscretely to increase the activity of the disease. The reasons for holding this opinion are not purely theoretical. A latent reactor (horse) purchased by the British Agricultural Committee previously referred to became clinically glandered within 24 hours of being retested with mallein. In Bonome's case, too, the injections were repeatedly folowed by temporary increased activity of the local lesions; and in our own case, though no reaction followed the use of mallein, the disease began to assume a more virulent type within a week of the injection, and this was thought to contra-indicate the further employment of mallein in the case. The limits within which mallein can be beneficially or even safely employed in human glanders can only be determined after careful experimentation in a large number of cases, and as yet it should be used only with the greatest caution, beginning with minimal doses, say of one tenth of a milligram.

Another reason for conservatism in this matter of employing mallein in human glanders is that mallein is a product which is very variable in strength. There is no known way of standardizing it, and though each firm probably attempts by following a method of its own to get a product that has a uniform action on the horse when given in a certain dose, still, it is known that mallein may be perfectly reliable for one species of animals and totally untrustworthy for a different species. This matter might be gone into at greater length, but enough has been said to show that we have no data from which to conclude whether or not a given mallein will prove reliable for human beings, and if so, in what dose.

Curiously enough, in view of the similarity between glanders and tuberculosis, when tuberculin was given in Neisser's case(108), owing to a mistaken diagnosis, the lesions then present healed up under its use. And Léonardo and Achille found that in a case of equine glanders treated with tuberculin the ulcers healed promptly and the pulmonary condition was greatly benefited

There are two methods of general treatment, however, that perhaps have more to recommend them, though both are empiric, and the second—bovine serum injections—has rarely been used in human glanders.

The first of these methods is MERCURIAL INUNCTIONS. These have been used by several men with varying results, but Gold's strong advocacy of this treatment is not to be lightly disregarded, in view of his extensive experience in human glanders. Gold had 24 cases of glanders in 28 years and all of these without exception died. His 25th case (100) was treated with mercurial inunctions, one drachm daily for three months; the patient recovered and was still in good health three years later. Two other cases were treated by him in the same way. Both of these recovered, and one of them(107), which was followed for nearly a year, remained well at the end of that time. These results

are so promising that this form of treatment should be given a trial in every case of glanders, in conjunction with other methods. It should be said that with the inunctions Gold used surgical treatment of the most radical kind.

The second method of treatment is the result of an attempt to apply serum therapy to glanders, and originated in the theory that as cattle are naturally immune to glanders, their blood serum when injected might prove curative in this disease. So far as man is concerned, the method is a comparatively untried one. It consists simply in the injection subcutaneously of bovine serum at intervals of from one to several days till a considerable quantity, perhaps 200 c.c. in all, has been injected. It was employed in but two cases of the present series, with good results in both. In Dupuy and Thiry's case (148), in which the only manifestations mentioned in Baumgarten's Jahrbucher were those of lymphangitis, thirteen injections were given in 21 days, and a month later the patient was discharged, perfectly well. In Nicolle and Dubos's case (141) the patient's condition was stationary after three months of treatment by rest, forced feeding and sodium cacodylate; 190 c.c. of heifer serum in two and a half months brought about a cure which was probably permanent.

We may now inquire briefly into the results obtained from forms of treatment which were considered in individual cases to be of benefit.

MERCURY was given internally in nine cases, of which two died, one was incomplete, five were supposed to be cured*, and one, in which acid nitrate of mercury cauterization was employed as well as calomel internally, was definitely cured. MERCURIAL INUNCTIONS were used in 18 cases, of which eleven died, three were incomplete, two were supposed cured and two were definitely cured. Mercury locally to the lesions was used in four cases, two of which improved greatly and one was supposed to be cured.

Of the cases in which IODIDE OF POTASSIUM was used eight died, one was incomplete, but improved by this treatment after mercurials had failed, two were supposed cured, one was probably cured, and two definitely cured. In one fatal case it is curtly said that antisyphilitic treatment did no good. In Cooper's case (94), which recovered, and in which the iodides of iron, calcium and sodium were used as well as potassium iodide, iron and quinine were thought to do more good than any other form of treatment.

IODINE was used locally in ten cases, of which three died, five were incomplete and two were considered cured. In one of these last the cure was probably permanent. In two of these cases prolonged baths in a weak solution of Iodine and Potassium Iodide were used with benefit.

ACONITE was used five times, twice in very large doses; three cases were thought to be cured (once the cure was probable and once

*SUPPOSED or POSSIBLE CURES are cases in which all symptoms and signs disappeared, but which were not observed for some months afterwards; PROBABLE CURES are such as remained free from symptoms for five to twelve months after recovery; DEFINITE CURES are such as remained well for a full year without any known subsequent recurrence.

definite), one case was incomplete and one died. CITRIC ACID was thought to do good in one incomplete case. Of nine cases in which IRON was used, one was probably cured, four were incomplete and four died. Of 16 cases in which QUININE or cinchona was given, one was possibly cured, one probably cured, one definitely cured, three were incomplete and ten died. CREASOTE was given internally in two cases, one of which was moribund; in the other (incomplete) case it was thought to do good. AMMONII'M CARBONATE was used twice; one case was supposed cured, the other (incomplete) was much benefited. Of two cases in which ARSENIC was used, one was supposed cured, the other died.

With regard to MALLEIN, it was given in six cases. Bonome (119) gave injections of 2 to 8 minims at intervals of 2 to 6 days with improvement in the local conditions and gradual diminution of the reaction to nil in two months. Buschke's case (126) was definitely cured, but here the lesions were confined to one arm and mallein was only used after excision of the foci and application of the thermocautery, and no reaction ever followed its injection in doses of 1 to 10 milligrams at intervals of 1 to 4 days. In two of Batko's cases, (135) and (136), doses of 1-10th to 1 milligram were used for a short time, but, as might be expected from the small doses employed, no reaction followed and these cases soon passed from observation. In Straka's case (148) mallein was used and recovery followed. The note available of his case is too short to permit of any further statement. In our own case only one dose was given, 2½ minims of the concentrated liquid mallein. No reaction followed. We have here no satisfactory data for our guidance as to the use of mallein in human glanders.

LOCAL SURGICAL MEASURES. As yet these are our most reliable means of fighting the chronic disease. It must be emphasized that the earlier the diagnosis, the prompter and more radical the surgical treatment adopted, and the more persistently it is carried on throughout the disease in spite of many discouragements, the better will be the results obtained in this most discouraging affection.

EXCISION OF FOCI. If there is a wound of entrance, it should be excised, and where possible, all the lesions should be similarly treated. The incision should go wide of the focus through perfectly sound tissue and should be made with all the care used in excising a malignant growth. After excision, an additional justifiable precaution is the application of the thermocautery or of pure carbolic acid followed by alcohol to the wound. As soon as new lesions arise, they should be similarly dealt with. Excision of foci was resorted to in 13 of these cases, including three in which a part of the body was removed. The results were three definite cures, two probable cures, two possible cures, once the final result of amputation of an arm after the disease had become general is not stated. In one case probably cured the initial focus was excised and the disease went no further. In two cases, one probably and one possibly cured, the final obstinate focus was excised In our own fatal case excision was used only once or twice and the local results were eminently satisfactory. The removal of the upper jaw and eye when the disease was far advanced locally did no good.

Probable cure followed excision of one testicle. In Musson's case (134) excision of the tonsils and pharyngeal focus in conjunction with the repeated use of 1% pyoktannin and the thermocautery caused apparent recovery for a time, though recurrence eventually proved fatal.

When foci cannot be excised entire, the method devised by Stuart should be employed. He cut down to, but not into, the focus, and filled the wound with liquefied carbolic acid before cutting into it. In this way he was generally able to avoid the infection of the incision which so commonly takes place after opening a focus. He also thoroughly swabbed out the cavity with liquefied carbolic acid and followed this by swabbing with alcohol to prevent toxic absorption. This proceeding may be repeated every two or three days. Pure carbolic acid and perhaps creasote and pyoktannin are almost the only local applications to the wounds that seem to have done good.

In no disease are the results of antiseptic measures more discouraging than in glanders. Liquefied carbolic acid was applied to the wounds in four of these cases; two of these recovered, one was incomplete and one (our own) died, though in this case a threatened phlegmonous inflammation of the forehead was thus eventually controlled, and the stubborn foci in which it originated healed soundly and permanently.

The THERMOCAUTERY is also an excellent means of dealing with foci which cannot be entirely removed. Fistulous tracts may be slit up and treated in this way or else excised. Of the cases in which cauterization by heat was employed three recovered, two of these permanently, and six died. In two of the fatal cases, however, temporary healing followed the use of the thermocautery.

Not infrequently CURETTING of foci is done. If this is ever preferred to excision, carbolic acid, or the thermocautery, it will be well to control the circulation in the part, where this is feasible, before operation, to lessen the risk of introducing the germs into the general circulation.

For the nasal discharge and the nasal ulcers creasote water, two minims to the ounce, carbolic acid, potassium permanganate and chlorine solution, are perhaps most likely to do good, though the changes may be rung on all the usual nasal therapeutic agents. Cauterization of the ulcers with pure carbolic acid, followed by alcohol, zinc chloride, silver nitrate, or the thermocautery may be tried.

Somewhat similar methods of local treatment are applicable to the other mucosæ when involved, though some of the measures above mentioned are obviously not to be recommended for the conjunctiva or the larynx.

Pulmonary involvement is to be dealt with on general principles. Creasote internally and in the form of inhalations may be tried.

Radical surgical treatment is advisable for the intracranial foci which are not very uncommon in glanders.

Glanderous involvement of the various internal organs can rarely be diagnosed during life. When diagnosis is possible, treatment is along the lines previously laid down, with medicinal symptomatic treatment as may be required.

Phlegmonous swelling of the face and other parts is to be dealt

with on general surgical principles, special regard being had to the strong tendency to gangrene that is present in glanderous phlegmon

Conclusions as to Chronic Glanders based on an analysis of these cases:

(1) INCIDENCE. Adult males who have had dealings with glandered animals—horses, men or experimental animals—are pre-eminently affected. Men are much more apt to contract the disease from other men than from animals.

(2) The MODE OF ENTRANCE of the Virus is much more commonly through the skin (? 75%) than by way of the mucous membranes (? 25%), and abrasion of the skin at the point of entrance seems to be the rule.

(3) The PERIOD OF INCUBATION usually varies between 6 hours and 5 days, but may be as long as 21 days.

(4) The RELATIVE FREQUENCY OF THE LESIONS will be obvious from an examination of the preceding table (v. p. 61). It may be pointed out that rashes, phlegmon and lymphatic adenitis each occur in about one-third of the cases; that multiple abscesses occur in 80% and nasal involvement, which is twice as common as ocular or buccal lesions, in about 40%; that clinical signs referable to the lungs seem to occur only in 25% of the cases, though focal pulmonary lesions exist in 70% of the autopsies; that localized purulent pachymeningitis is by far the most common intracranial lesion; and that involvement of the abdominal organs rarely causes characteristic manifestations.

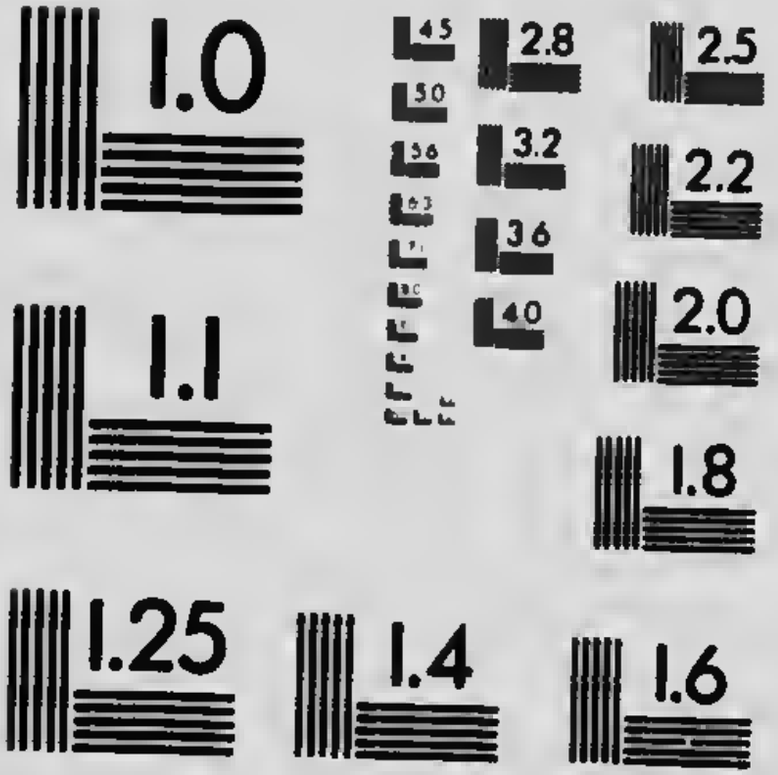
(5) For DIAGNOSIS repeated animal inoculations and cultures may be required.

(6) The CURABILITY of chronic glanders has been greatly over estimated. Scarcely 6% of these cases were definitely cured. Possibly the number of cures may be added to by the discovery that cases of purely local or very mild infection occur more frequently than is supposed.

(7) The DURATION, including many incomplete cases, averaged 14½ months. It varied between six weeks and 15 years.

MICROCOPY RESOLUTION TEST CHART

(ANSI and ISO TEST CHART No 2)



APPLIED IMAGE Inc
1653 East Main Street
Rochester, New York 14609 USA
(716) 482 - 0300 - Phone
(716) 288 - 5989 - Fax

And now that we have finished considering this part of our subject, it seems necessary to attempt a definition of chronic glanders, founded on our study of these cases, though the unsatisfactory nature of all attempts at definition is freely admitted.

Definition of Chronic Glanders. A chronic specific disease of the infective granulomatous type due to the Bacillus Mallei, usually contracted from horses, very commonly through an abrasion of the skin, characterized in man by the appearance of some or all of the following phenomena: viz. by a usual incubation period of from one to five days, though this may exceptionally be prolonged to three weeks, by a tendency to specific, often suppurative lymphangitis; by the development of specific neoplastic formations which commonly break down and form abscesses in the subcutaneous tissue, lymph glands, muscles, joints, bones and internal organs, especially the liver, the spleen, or the cerebral meninges, rarely of the kidneys; specific inflammation of and discharge from the mucous membranes, particularly those of the nose, mouth, throat and eyes, usually due to ulceration following the breaking down of specific neoplasms in these regions; by the formation of new growths with a strong tendency to necrosis, such growths being very common in the pleuræ and lungs, there causing a specific pleurisy or broncho-pneumonia, and occurring rarely in the gastro-intestinal tract or peritoneum; by the occasional development of a papulo-pustular or bullous eruption, or of phlegmonous inflammation which may develop in the subcutaneous tissues in any part of the body, but is most common about the face or head, and, next to this, in the extremities, this phlegmon being specially liable to be followed by gangrene or phagedænic ulceration; the disease being subject to periods of remission or apparent cure, which may be prolonged, but being as a rule eventually fatal from exhaustion or from a generalization of the virus, not rarely with pyæmic manifestations.

APPENDIX ON CANADIAN GLANDERS.

Equine Glanders in Canada. Though it cannot be said with certainty when glanders was .. t introduced into Canada, it is not improbable that the disease was originally brought by the Army horses which came over from England and France in the 18th Century. Up to 50 years ago veterinary practice in this country was almost altogether in the hands of empirics, so that no reliable veterinary evidence is available as to the prevalence of glanders till within that period. However, from the fact that Dr. Smallwood, a country practitioner near Montreal, was able in 1845 to diagnose accurately a case of human glanders—the second human case so far as the writer has been able to ascertain that ever occurred on this Continent—we may safely infer that by this time glanders was a well-known and wide-spread disease among horses in the Province of Quebec, and the circumstances connected with Richardson and Morrison's case in 1848 suggest a considerable prevalence of the disease in Ontario at this period.

There is evidence that equine glanders has existed to a very considerable extent in Manitoba, and particularly the Northwest Territories, ever since the country was settled. Dr. J. G. Rutherford, Veterinary Inspector General for Canada, to whose great kindness I owe all my information as to glanders among horses in Canada, came across and destroyed a large number of native glandered horses, while acting as Veterinary Surgeon to the Northwest Field Force in the Riel Rebellion of 1885, being at that time also Inspector of Stock for Manitoba. Unfortunately the Dominion Government then shelved Dr. Rutherford's report on these facts and took no steps to stamp out the disease. "Since that time", to quote Dr. Rutherford's own words, "the Northwest Territories have been a distributing source of the disease to other parts of the Dominion, while outbreaks have also greatly increased within their own boundaries, rendering the task of eradication very much more serious than it would have been if undertaken at an earlier day." From 1898 to 1902 (inclusive) approximately one hundred cases of glanders yearly were dealt with in the Northwest Territories.

For about twenty years the Manitoba Government has been doing everything in its power to stamp out glanders, and it is mainly because of the entrance of fresh sources of the disease from the Northwest Territories and the Northern States that glanders has not entirely disappeared from its boundaries. As it is, the number of horses destroyed for glanders in this Province, which for years averaged approximately one hundred per annum, was 50 in 1902, and 60 in 1903, the increase in the latter year being attributed to the increase of horses imported from the Northwest Territories. Mallein was not invariably used on all animals in contact with glanders nor on the majority of animals clinically affected in Manitoba.

It may here be said that the possibility of curing equine glanders

in the form of farcy was early recognized in Canada. In 1889 Dr. J. G. Rutherford, then Inspector of Stock for Manitoba, treated an undubitably farcied horse with large doses of Sodium Hyposulphite after obtaining permission of the local Government to do so. The animal recovered perfectly and remained in good health for several years, when it was lost sight of.

Unfortunately, elsewhere in the Dominion glanders was dealt with in a very half-hearted way till within the last few years. Previous to 1902 the matter was seen to partly by the Dominion Government, but mainly by the individual Provinces. Probably the great majority of cases were not reported to either of these authorities, but were dealt with or neglected as the veterinarians or empirics who met with the cases decided.

Since 1902, however, the power of dealing with glanders, as with veterinary matters generally, for the whole Dominion, with the exception of the Province of Manitoba, has been entirely in the hands of the Dominion Government. Manitoba has likewise recently come under Dominion control, so that throughout the Dominion all matters connected with the health of animals are in the hands of one central authority. This method is an ideal one when the authority is in the hands of the right person; and no one who has looked into the Reports of the Health of Animals Branch of the Department of Agriculture for the Dominion, since Dr. Rutherford was in charge, can doubt that excellent work is being done in the present case. Experiments of the utmost practical and scientific importance are being constantly carried on on a large scale, and the method, immediately to be described, of dealing with glanders is but a solitary example of the thoroughness with which every branch of this work is being carried out by the Department.

The method adopted in 1902 by Dr. Rutherford in dealing with glanders was as follows:—

A Veterinary Officer of the Department was immediately sent to investigate each outbreak of glanders reported. Where the clinical diagnosis was absolutely certain, the diseased animals were immediately destroyed, but in all cases where there was any possible doubt as to the matter, the animals clinically affected were tested with mallein, and if they reacted, all horses that had been in contact with them were similarly tested. Horses which showed clinical signs and which reacted to mallein were invariably destroyed. Reactors that showed no clinical signs were subjected to the following restrictions. The owner was forbidden to sell or otherwise dispose of such animals, he was forbidden to stable them elsewhere than on the premises they were on; he was obliged to keep them isolated from non-reactors; and was required to have them available at all times for Government inspection. These were absolutely the only restrictions imposed on such animals. To identify these animals one hoof was branded 'E.R.', and if the horse died the owner had to preserve the branded hoof to prove its death.

As to what constitutes clinical symptoms sufficient to condemn a horse that reacts to mallein, there is some difference of opinion. Nasal discharge with submaxillary enlargement or farcy sores is of

course sufficient to do so. Dr. Rutherford holds that enlargement of the submaxillary lymph-glands in a reactor is proof of some irritation in the nasal mucosa which probably causes slight nasal discharge from time to time, though macroscopically there may be no discharge and no ulceration in the visible portion of the nares. Strictly speaking, then, submaxillary enlargement in a reactor should be sufficient to condemn a horse. But under a system of non-compensation inspectors were apt to be lenient and the horse was apt to be given the benefit of any doubt there might be in the matter.

Reactors with no clinical signs were retested in 40 days and if they still reacted, again 60 days after the second test. As to latent reactors which failed to react at the second or third test, their sale was still forbidden and they were still required to be available for Government inspection, but the other restrictions were removed. If an animal still reacted after three tests, an endeavor was made to persuade the owner to consent to its destruction. If he refused, the animal was given a final chance, particularly if the later reactions were diminishing in intensity. Horses reacting at the fourth test made 90 days after the third were slaughtered, even though no clinical signs were present. If they failed to react at this final test, they were treated as other ceased reactors.

It may be stated that though this system has recently been abandoned in Canada for one far better, the former system is still far superior to the method, or lack of method, which now prevails in the United States in dealing with glanders. There is in the United States no central authority to deal with veterinary matters. Nominally the disease is controlled by the individual States, but, as the answers to the inquiries sent to the various State authorities a year or two ago by Dr. Charles H. Higgins, Government Pathologist to the Dominion Health of Animals Department, clearly show, this duty is in practice neglected by them in many cases.

It has been Dr. Rutherford's policy to keep track of these ceased reactors. The British Departmental Committee appointed to investigate the contagiousness of glanders found that ceased reactors when tested a year after the final test generally developed an abnormally high temperature, and this seemed to Dr. Rutherford a suspicious thing, even though the lesions in such animals were not shown to contain living bacilli. Latent reactors which developed clinical signs were of course immediately destroyed. It was found that animals giving a temperature of 105°F. at the first test rarely showed much improvement when subsequently tested.

Expensive and irksome as was this system of repeated testing, it seemed the fairest that could be adopted under a system of non-compensation; and it may be added that this method of dealing with glanders was more advanced than that of any other country when it was adopted in Canada. The British Departmental Committee already referred to had concluded that the danger of infection from latent reactors, even when allowed to mingle with other horses in the freest possible manner, was but slight. Under such a system of isolation as that described, it might reasonably be expected to prove nil. And to insist on the destruction of apparently healthy animals

without any compensation was obviously unjust. For this reason the system described was continued in force for about two years. In a country as extensive as Canada, however, the expense of retesting was enormous, as the distances to be travelled were so great. Moreover, a latent reactor might develop clinical signs and infect numerous other animals in the period intervening between the inspector's visits, for it was obviously impossible to keep constant watch of every case to see that the isolation enjoined was rigidly observed.

The results obtained at the end of two years by the method above described were briefly as follows:—

Nearly 900 horses had reacted when tested during the two years. Of these not 25 per cent. had become ceased reactors. The proportion of horses thus saved did not appear to be large enough to pay for the expense incurred. From an economic standpoint this objection to the system was a forcible one, but an even more important reason for remodelling it was found, thanks to Dr. Rutherford's keeping track of all ceased reactors in Canada during this period. Outbreaks of glanders were occasionally noticed in which the disease was directly traceable to a ceased reactor; so that, not only was the system which had been adopted under the stress of existing circumstances a very expensive one and one that finally saved a relatively small proportion of the horses so dealt with, but even the small proportion of horses spared under this system might on rare occasions become a source of danger to other animals.

This fact is of the utmost practical importance; for the prevailing opinion has been that though latent reactors might under exceptionally favorable circumstances communicate the disease, ceased reactors were never a source of danger. Two years ago Dr. Rutherford uttered a note of warning on this point. In his address before the American Veterinary Association in 1903 he distinctly stated that he was not prepared to say that because a horse had ceased to react to mallein, it was cured of glanders, nor that mallein could certainly be regarded as the curative agent, even if a horse definitely glandered were cured after its use. Dr. Rutherford himself cured a farcied horse in 1889, before mallein was discovered, and not long ago a horse with nasal discharge, enlarged submaxillary glands and a typical mallein reaction was kept alive owing to a misunderstanding of instructions by a Canadian Government Inspector. The clinical signs entirely disappeared and this animal became a latent reactor.

In 1904, on the recommendation of Dr. Rutherford, the Canadian Government agreed to pay two-thirds of the value of all horses which reacted to mallein, but were not clinically glandered, provided only that the owner consented to their immediate destruction. If this offer was refused, the horse was to be kept under the restrictions already described for latent reactors, but the retesting was to be done by the Department at the owner's expense. If at any time it became clinically glandered, it was destroyed at once without compensation. The original plan was to destroy all animals clinically glandered without compensation, as before; but this has been modified so that now all horses that react to mallein are immediately destroyed without option and the owner receives two-thirds of their value at a fair reckoning.

This system is radical, since it gets rid not only of clinically glandered horses, but also of those latent reactors which are a constant menace to other animals; it is also eminently fair, for it does not destroy a man's horse mainly for the benefit of the community and still make the man himself bear the whole cost. Dr. Rutherford is to be congratulated on the satisfactory solution he has found for this difficult problem; and it cannot but be a source of satisfaction to all Canadians that this country has taken the lead in a matter so important not only for the prosperity of the country but for the preservation of human life and human health as well. For it is believed that there is no other Government either in America or in Europe that has a system so nearly ideal of dealing with glanders as that now adopted by the Canadian Government.

The expense to the Government of carrying out this system will of course be very heavy for some years, but there is no doubt that, energetically carried out, this policy will be the most economical eventually.

The efficacy of the system in bringing to light cases of glanders that would otherwise have been concealed has been abundantly demonstrated by the fact that already during the year just completed, 2000 glandered horses have been killed—more than four times the number dealt with during any previous year. And the wisdom of abandoning the policy of retesting has been borne out by the comparative frequency with which during the current year outbreaks of glanders were directly traceable to ceased reactors.

A common method of disinfecting stables infected with glanders is as follows. Mangers, etc., are torn out and burned. A solution containing lye is used to remove grease, etc., after coarse dirt has been removed. The whole surface, walls, ceiling, floors, is thoroughly sprayed with 5% crude carbolic acid, and again with lime-wash containing crude carbolic acid, 5%. The cyclone burner is not used, for it is the duty of the owner and not of the Department to see to the disinfection and the use of this apparatus in careless hands is attended by danger of fire.

A brief statement may be added as to the regional prevalence of equine glanders in Canada since 1902. Previous to that time the only investigation of an outbreak by the Dominion authorities in the Province of Quebec was that instituted as the result of the development of our own human case, so far as the writer has been able to ascertain.

During the year ending October 31st, 1903, 1[illegible] horses were tested with mallein, of which 406 reacted and 64 of these ceased to react when repeatedly tested. 69 cases of equine glanders occurred in Ontario, of which 37 were in Ottawa or its immediate vicinity, and 23 cases in Quebec. In the Northwest Territories the number of cases rose from 112 in 1902 to 219 in 1903. There were two cases in British Columbia; several cases also occurred in the Yukon, but these were not dealt with by the Dominion Government. No cases were reported from the Maritime Provinces.

During the year ending October 31st, 1904, 219 horses were destroyed on inspection and 1387 tested with mallein. Of the latter 280 were destroyed at once and 42[illegible] reserved for retesting. 164 horses,

a considerable number of which were carried over from the previous year, were classified as eeased reaetors.

35 eases oeeurred in Ontario, 55 in Quebee. None were reported from Montreal, but the inspeetor who dealt with a eonsiderable outbreak in the neighborhood of St. Hyaeinthe was inelined to attribute the disease to eheap horses brought from Montreal. The writer has personal knowledge of one horse bought in Montreal which was subsequently found to have glanders, and during the year just elosed at least one outbreak oeeurred in Montreal. Two eases were dealt with in British Columbia and three in the Yukon. Again the Maritime Provinees appear to have been free from the disease. The great inerease in the number of eases dealt with during 1904 was almost entirely due to the very large number deteeted in the Northwest Territories—404 cases. Doubtless this increase is more apparent than real and is due to more adequate inspeetion and to the policy adopted of testing all eontaet animals, rather than to a greater prevalence of the disease. Figures showing the distribution of the 2000 eases dealt with during 1905 are not yet available, as Departmental rules forbid the giving of additional information as to the work being done. It is Dr. Rutherford's intention to publish in a speeial report the exeeeding valuable results obtained by the Department in the extensive use of mallein during the past three years. The appearanee of this report will be eagerly looked for as an epoch-making event in the development of scientific knowledge as to mallein.

Mallein. So hazy and unsatisfaetory is the information obtainable as to the production of a reliable mallein of uniform strength that some account of the method employed by Dr. C. H. Higgins, Government Pathologist to the Department, information as to whieh was courteously furnished me by himself, may be of interest. For over two years Dr. Higgins has been manufaeturing at the Government Laboratories all the mallein used by the Department in Canada, and eonsiders that by his method he is furnishing a stronger mallei than any on the market.

The great diffieulty in the manufaeture of mallein is the impossibility of obtaining any reliable method of standardizing it. An attempt was made to estimate its strength by the results produeed on injeeting it into glandered guineapigs. This method was found to be absolutely unsatisfaetory and unreliable. Dr. Higgins found, as other observers have also noted, that when mallein, whieh on subsequent trial upon horses proved absolutely reliable and gave in them good reactions, was injected into a series of ten indubitably glandered guineapigs, perhaps not more than two or three of the ten gave any reaetion.

The method employed by Dr. Higgins in the preparation of the mallein is as follows:—

Cultures taken from the original eulture obtained by Dr. Higgins from a glandered horse, are re-inforeed from time to time by passage of the germs through a series of guineapigs, sometimes two or three, sometimes more. Inoculations are made from a culture kept virulent

in this way into sterilized broth made up according to the following formula:

Johnston's fluid beef,	1 part,
Armour's peptone,	1 part,
Sodium chloride,	½ part
Glycerine,	6 parts,
Water, to	100 parts.

These cultures are grown in large flasks at a temperature of about 39° C. for six weeks. According to Dr. Higgins, the requirement that must be fulfilled by these cultures is that 1 c.c. of the culture, after being grown for three weeks, inoculated intraperitoneally into a guinea pig weighing at least 500 grams, shall kill the animal within eight days. If this condition is not fulfilled, the culture is not considered available for the manufacture of mallein. After some experience, however, Dr. Higgins does not find it necessary to test in this way in every instance.

After the bacilli have been grown for six weeks in this way, the culture is sterilized and evaporated to about one quarter of its original bulk.

Under aseptic precautions the product is then filtered through ordinary filter paper, bottled in small vials containing one dose, 2½c.c., each, and stored. The product is kept in the dark in a part of the laboratory the temperature of which does not vary much from 40° F. the year round. Under these circumstances it is considered that the product will keep almost indefinitely, though care is taken to keep the stock constantly changing. When sent out from the laboratory it is dated two months ahead. After the date stamped on the vial has expired, the product is destroyed.

THE MALLEIN TEST AND HOW IT IS APPLIED IN CANADA. (From a circular issued by the Biological Laboratory)." To obtain the animal's normal temperature, at least two temperatures are taken, three hours apart, on the day mallein is to be injected. The contents of one vial, 2½c.c., are then injected hypodermically with a syringe previously sterilized with $\frac{1}{20}$ carbolic acid or an equal strength of creolin emulsion, the skin at the point of injection being similarly disinfected. No dilution of the mallein is made at the time of the injection, which is usually made in the side of the neck, as the local reaction is more prominent in this region. After injection five temperatures should be taken at three hour intervals, beginning the 8th hour after injection.

" In an animal with glanders or farcy there follows a double reaction, either form of which may be diagnostic, viz. a rise in temperature or a painful œdematous swelling at the point of inoculation, gradually increasing in size for a period of 24 hours or longer. Either form of reaction is usually accompanied by more or less debility."

The following note of warning is added: "In advanced cases where the disease has permeated the whole system, the local reaction may be very slight or altogether absent. It must be borne in mind that in cases where there is an abnormally high temperature and

necessity prevents delay in applying the test, a lowering of the temperature should be considered as suspicious, and the animal held under observation for a retest under normal conditions."

Human Glanders in Canada. Very little that is general can be said on this subject. After a somewhat industrious search of the literature, the writer has only been able to find four Canadian cases on record.

Yet there are indications that human glanders in Canada is by no means so rare as the foregoing statement would lead one to suppose. Dr. Smallwood, a country practitioner of Isle Jésus, near Montreal, was readily able to diagnose during the patient's life a case of glanders, the second reported on this Continent. And what appears to have been the fourth case reported in the Western Hemisphere, one which occurred near Toronto in 1848 was only published in 1904 in the Canada Lancet from Dr. Richardson's note-book. Dr. John Reddy's Montreal case, published nearly 30 years after, in 1876, was apparently the next Canadian case reported, though by a search through the mortality records for Montreal Dr. Reddy was able to find three cases of fatal glanders that had occurred during the preceding year in Montreal. L. F. J. Shepherd informs the writer that about this time an epidemic of human glanders, about a dozen cases in all, occurred in Montreal, but the writer has not been able to get any account of these. To these cases the writer is able to add, by the courtesy of the Medical Board of the Montreal General Hospital, the account of a case that occurred in Dr. Wilkins' service at the Montreal General Hospital in 1885. In 1889 O'Brien's case, the last Canadian case to occur that has yet found its way into medical literature, was published.

It is evident then that glanders in Canada was not in former years the rare disease that it is generally supposed to have been. And, although no Canadian case has hitherto been published that occurred between the year 1889 and the present date*, there is some evidence that human glanders in Canada is even yet by no means a very rare disease.

Even if we omit all reference to three cases, the diagnosis of which was somewhat doubtful, though they were not improbably glanders, the writer has through the courtesy of Dr. Rutherford, who most kindly had inquiries made by his inspectors as to the occurrence of human glanders, been able to get notes of two clear human cases, one of which occurred only in August and September of this year (1905). It is likely that several cases of human glanders occur annually in Canada. Some of these are overlooked here, as they are in other parts of the world, owing to the relative rarity of the human disease and the variability of its symptomatology. Moreover, the clinical features of the human disease may differ so widely from those seen in the animal from which the disease is contracted, that it is no disgrace to the medical profession to admit that not improbably many cases of Canadian human glanders have gone unrecognized, in view of the difficulty not very rarely experienced even by expert bacteriologists

*Our own case is published here for the first time, also that of McCullough.

with every modern means of investigation at their disposal in finding out the true nature of the disease.

The Canadian cases of glanders will now be presented *seriatim*.

Cases of Human Glanders in Canada*.

Smallwood. British American Journal, I, 1846, 201.—A farmer, aged 42, took ill on April 20th, 1844, with headache and pain in the back of the neck, worse on movement and severe enough to prevent sleep. When seen on April 22nd he had in addition to these symptoms slight redness and swelling of the right eyelid, and the symptoms usually accompanying any febrile condition, with a pulse of 90.

He was given purgatives and lead lotion was applied locally. On April 24th his headache was better, but there was pain in the neck and limbs, the swelling of the eyelid had increased, and his throat was sore. The bowel movements had been free and offensive. On April 25th the right eye was completely closed by the inflammatory swelling, the patient was very restless and had a pulse of 100, deglutition was difficult, there was general pharyngitis, and the nasal and buccal secretions were increased. The breath was offensive, the tongue furred, the bowels loose, with dark offensive movements. He was given Calomel, grs. ii, and opium ¼ grain every hour.

It was found on inquiry that the patient had had a glandered horse in his possession for a short time past and that while the patient was giving the animal a drench two or three days previous to the onset of his illness, it had snorted in his face. He paid no attention to this and did not wash his face for some time afterwards. A diagnosis of glanders was now made.

About midnight of April 25th, complaint was made of intense heat of the head, neck and throat, and dysphagia was increased; both eyes were swollen; there was dyspnœa; the stools were dark, liquid and offensive; the pulse was 110 and there was occasional delirium. He was given tincture hyoscyamus, 1 dram, in camphor mixture, 1 oz.

By 1 p.m. on April 26th the eyelids could not be opened on account of the livid swelling; the surface temperature had fallen; he was delirious and unable to swallow; the nasopharyngeal secretion was dark and viscid; the pulse was 120 and small, and the motions, still offensive, were passed involuntarily. A number of pustules, the size of small-pox lesions, containing dark red fluid, had appeared that morning on the legs and body with two similar lesions on the face. There was dyspnœa, muttering delirium and subsultus, and the skin was bathed in perspiration. By 8 a.m. on April 27th he could hardly be roused. The naso-pharyngeal secretion was copious and very offensive. Death occurred at 6 a.m. on April 28th. No autopsy was permitted.

NOTANDA. This case is the first recorded in British North America, and apparently the second on this Continent. A definite diagnosis was made by Dr. Smallwood INTRA VITAM, and even before the appearance of the pustular rash. The period of incubation was apparently two or three days.

Richardson and Morrison. Canada Lancet, XXXVIII, 1904-05, 415.—Morrison had for some time been treating a man living near the Don for intermittent fever, with quinine and pil. hydrarg. The patient had had rheumatic attacks in different parts of the body and one knee was inflamed. On April 3rd, 1848, as he was quite feverish and costive, he was given a purgative after being bled.

When seen by Dr. Richardson in consultation on April 10th, 1848, the facies was anxious, eyes congested, pulse rapid and weak, and there was profuse sweating. Breathing was noisy and accompanied by a mucous click, which disappeared when the mouth was open. There was also cough with hurried labored breathing, the tongue was furred and the bowels positive. Several swellings like boils had appeared in the preceding 24 hours, one on the back of the left hand, one on the side of the nose and some on the arms. These were large, hard and purplish, with considerable redness surrounding, and one or two of them were suppurating. The left knee was swollen and red and just in front of it was the largest of all these lumps. There was great prostration and slight subsultus, but the mind was clear. The posterior

---

* Information regarding two or three additional Canadian cases was obtained since Dec. 1905, when this paper passed out of the writer's control.

fauces were congested and purplish. It was considered that the dyspnœa was partly at least due to trouble in the posterior nares. Camphor was given and mustard applied to the throat. Next morning the patient was weaker, abundant thin mucus was oozing from his nose and he died. There was no autopsy.

Inquiry elicited that the patient had had several glandered horses for six months previous. An examination made at the time the patient was visited showed that three of the horses had nasal discharge and one, submaxillary enlargement. The man had been seen to drink from a pail after the horses and to wipe their noses with his handkerchief or his fingers.

NOTANDA. This, apparently the second case to occur in British North America, and the fourth on this Continent, was not published till over fifty years after the occurrence. Moreover, even the neighbors when talking with Dr Richardson about the man's horses, said that they had glanders, "AND THAT IS WHAT HE HAS TOO." Such a statement throws an important side light on the frequency of human glanders in this country in former times. This may have been a chronic case, but cannot be included as such, seeing that no statement is made as to the duration of the supposed ague, further than that the patient was under treatment for it for some time.

John Reddy. Canadian Medical and Surgical Journal, IV, 1876, 401.—An engineer came by boat from Moisic Mines to Montreal, leaving there November 3rd, and arriving Nov. 5th in good health. From Nov. 9th to Nov. 13th he felt at intervals peculiar, uneasy, but not painful sensations, about his body and limbs. On Nov. 13th he had a severe chill followed by sweating.

When seen on Nov. 14th, he had a temperature of 100⅘°, with the usual febrile symptoms and shooting pains in all the extremities and right scapula. There was some dyspnœa, but no pulmonary signs. A diagnosis of probable incipient typhoid was made.

On Nov. 15th, temperature 99⅘°; some headache, also soreness and dryness in the throat, which was slightly congested. On Nov. 16th at midnight a severe rigor occurred, followed by profuse sweating. The case was now thought to be malarial, particularly as he had had the disease some years before, so quinine, grs. xx, was given, to be followed by grs. v each four hours till relieved. On Nov. 19th a very tender swelling the size of a goose egg was found extending from beneath the right clavicle to the third intercostal space, said to have arisen during the past night. Poultices and Iodine paint were applied to it. On Nov. 20th there was marked weakness and general pain. The quinine was lessened to grs. ii each four hours, but on Nov. 22nd he was very weak and perspiring profusely. The swelling on the chest had nearly disappeared. He was given port wine.

On Nov. 24th the pulse was 100, patient very ill, sweating unabated, though no rigors for two days. Along both arms and legs were firm, tender, filbert sized swellings with no tendency to break down. In the suprascapular fossa was a globular tumor larger than a goose egg. Trichinosis was considered but negatived. Urine was free from albumin. Brandy was substituted for the port wine. Nov. 27th, very severe pains in arms and legs and great depression; tumor over scapula had subsided, but another equally large had appeared in the upper right parietal region. Pink streaks of lymphangitis were now seen for the first time, connecting the tumors. Nov. 29th, profound prostration; pulse 120; temperature 104°. Nov. 30th, a few dark erythematous patches seen on the extremities.

The case was seen in consultation by Dr. Ross, but beyond a recognition of the septicæmic nature of the disease no diagnosis was made. Tincture of iron in 30 minim doses was added to the quinine. Dec. 1st, great debility and sweating; a number of vesicles had appeared on the arms and shoulders, quickly becoming pustular, containing thin pus surrounded by a lymph-like fluid, and with a pinkish base. These appear in successive scanty crops evolving in four or five hours. Pulse 120, temperature 102⅘°. Dec. 2nd, prostration and generalized pains increasing; pustular rash on face; a large chancroidal pustule near right ala nasi.

The statement was now volunteered that on his passage up to Montreal the patient had been obliged to see to 14 horses, ten of which had offensive nasal discharge, two of them dying on the way. Twice the offensive smell in the horses' quarters had made the patient vomit.

The diagnosis of glanders was now clear. Dec. 3rd, urine contained albumin and probably blood, but no casts. At 4 p.m. he developed pain under the right scapula, short cough and dyspnœa. There was dulness from midscapula to base on

the right side, with a coarse friction rub and occasional crepitations. During the night pulmonary signs became more grave, a yellowish fœtid discharge appeared from the nose; there was low muttering delirium and death occurred at 2 p.m. on Dec 4th. There was no autopsy.

NOTANDA. General symptoms ten days before local manifestations occurred; the evanescence of some large lesions; the comparatively late rash, in small, successive crops: the final definite nasal and pulmonary signs.

Wilkins. Montreal General Hospital Case Reports, XIV, 49. — These notes, previously unpublished, were here included by kind permission of the Medical Board of the Montreal General Hospital. The original notes were by Dr. Sharp and were continued by Dr. Gustin.

A carter, aged 23, healthy till the onset of his present illness, was admitted to the Montreal General Hospital in the service of Dr. Wilkins on April 28th, 1885, complaining of constant pain in the dorsal and lumbar regions. The history given was that while imbibing freely on April 22nd, the patient had got wet and subsequently slept in his wet clothes in a hay loft. Next morning he developed dorsal and lumbar pain. He had also a headache and the symptoms usually following debauch. He continued his work till that evening, when he felt chilly and had cold perspirations, particularly when in bed. The pain in his back extended upwards and backwards and so increased as to prevent the patient from leading his usual active life, though his appetite was fair and his bowels regular. He did not vomit, but there was great thirst.

On admission there was a fairly well limited area of tenderness over the lumbosacral articulation. He had also pain in the right thigh extending up and down the right femur, but most marked over the trochanter. No other joints were involved and there was no history of previous rheumatism. The tongue was coated, anorexia was present and the bowels constipated: liver and thoracic organs normal. For three days after admission the temperature ranged from 100° to 102° F., once falling to normal. Cold perspirations and chilly sensations occurred nightly and there was a herpetic eruption of the lips. There was no inflammatory reaction over the affected parts. On admission he was given Sodium salicylate, grs. xx each two hours for four doses.

On May 2nd he had severe epigastric pain with ringing in the ears and headache, which ceased on discontinuing the salicylates. The pains were much less, otherwise the condition was unchanged. The bowels were moved with Ol. Ricini; the tongue was clearing up and the appetite improved. On May 5th there was a scanty bloody discharge from the nose, which only lasted during the night. On May 6th the right and left ankles and right wrist were greatly swollen and inflamed. Temperature 103-104°, pulse 100 and fairly good as was the general condition of the patient. On May 8th the left wrist and both knees were greatly inflamed, temperature 104°, pulse 110. There had been some præcordial pain, but this was now diminishing. A pustule was noted over the malar bone. On May 9th a blowing systolic murmur, transmitted to the right of the sternum, was heard at the aortic cartilage. Another large pustule had developed on the upper lip.

On May 10th the joints previously mentioned were still greatly inflamed; temperature 102°, pulse 110; expression haggard and features drawn; very delirious; sweating profusely; murmur unchanged; catheterized. He was given a few doses of sodium salicylate and of potassium bromide. Several of the papules noticed on the previous evening had become pustular; the two first pustules were now surrounded by a distinct areola, and were situated on an inflamed base. On May 11th there was low muttering delirium and great prostration; joints greatly swollen and œdematous, several of them, including left wrist, fluctuating. Deposits of fluid were present in right leg anteriorly; numerous pustules were noted on the face, wrists, legs and body. At first papular, they soon became pustular or disappeared; originally shot-like to the feel, later they became depressed in the centre. A thick, very tenacious, mucosanguineous secretion blocked the left nostril. Pulse 120, evening temperature 105°. On May 12th, temperature 104°, pulse 130, respirations 30 and stertorous. One nostril was completely blocked. The patient had a haggard look with contracted pinched facies; the face was partly swollen and erysipelatous, particularly around groups of pustules; the tongue was dry and brown; the teeth covered with sordes. Dried secretion covered the upper lip, but the nasal discharge had ceased.

The papules of May 11th had become pustules, mostly with an inflamed base

though in some cases the base was not inflamed. These pustules had very thin walls and were filled with thin pus. The pustules present on May 11th had ruptured, discharging their contents and from dessication had become scabs with an inflamed areola. The rash presented the same characteristics in every region and was most abundant on the face, legs, dorsum of the feet, arms, chest and back. A subsequent note states that the fluctuating deposits of pus had increased over the regions previously mentioned, and were most developed over the left leg and the right thigh. Other joints were affected and had an erysipelatous appearance. Prostration was extreme and there was stupor, though nourishment was taken when put to the lips. Coarse tremor of the hands developed and the patient became comatose and died.

At the autopsy, performed by Dr. Finley, in addition to the farcy buds, nodules were found in the lungs, although no pulmonary involvement was noticeable during life.

NOTANDA. The vague rheumatic onset; involvement of large joints successively and transient nasal discharge two weeks later, followed by papulo-pustular, umbilicated rash appearing in successive crops, intramuscular foci, gluey nasal discharge, phlegmon of face, and pulmonary involvement found at autopsy in spite of the absence of clinical signs pointing to lung trouble.

Anonymous Manitoba Case, private communication.

In 1885 a man who had had dealings with his glandered horses had a series of abscesses subcutaneous and intramuscular. Nasal discharge was superadded to these symptoms and the patient died after three months illness.

This case was not diagnosed glanders, but the clinical history seems fairly clear. It is included with some hesitation.

O'Brien. Montreal Medical Journal, March 1889, p.641—A man aged 37, previously healthy, was hurt on Nov. 23rd, 1888, while attending diseased horses where he worked. Since then he had very severe frontal headaches, great thirst, anorexia, loss of sleep, constipation, general malaise and chilliness. When first seen, on Nov. 27th, there was slight tenderness and redness of the lymphatics along the inner sides of the legs, but no glandular swelling nor venous tenderness, and no skin abrasion. Temperature 102°, pulse 100. An elastic abscess, not very tender, was found in the right biceps. Nov. 28th, no sleep; pulse and temperature unchanged, although antipyrin, ½ dram, had been taken within six hours. The abscess on incision discharged an ounce of bloody pus. Supporting liquid diet was given with six ounces of whiskey. Nov. 29th, no sleep, although six ¼ gr. tablets of morphia were taken in six hours; temperature 103°, pulse 106; vomited once. Lymphangitis of legs was a little more marked. He was given tincture ferri, xv minims, each four hours and calcium sulphide gr. ¼ each six hours. Nov. 30th, chloral, two drams in six hours, gave no sleep and no relief; temperature 103°, pulse 110. Red streaks on legs more defined; certain tender spots were noticed on the inner side of the right leg and a rather superficial hardness the size of an almond. Poultices were applied.

Dec. 1st, pain in knees but no objective abnormality. Dec. 3rd, excruciating pain, but no objective signs, in left knee; more diarrhœa. Dec. 4th, two hours of sleep followed administration of 40 drops Battley's solution within an hour; temperature 102½°, pulse 112; less pain. Two small abscesses in left leg, then noticed to be developing, were opened on the day following. No superficial redness and only deep tenderness. Diarrhœa checked. Dec. 5th, a better night, but was slightly delirious; temperature 102°, pulse 108. Dec. 7th, two more abscesses opened below left knee; a few acne-like papules had appeared, some of them angry-looking. Some difficulty in nasal breathing; prostration. Dec. 8th, abscesses opened below right knee and two below right elbow; nostrils still obstructed; papules becoming pustular; typhoid state more marked. Dec. 9th, low muttering delirium; temperature 103½°, pulse 128; urine passed involuntarily; new abscesses opened on right hand and arm, all previous abscesses still discharging, that on right arm had an angry appearance and was excavated; pustules on forehead had same excavated appearance; there was thin, inoffensive nasal discharge. Dec. 10th, temperature 103°, pulse 130 and weaker; nasal discharge persistent; considerable erysipelatous swelling, large round forehead ulcer; diarrhœa; still takes nourishment. Dec. 11th, swelling of forehead greater; nose swollen and discharge diminished. Pulse 140, temperature 104°; delirium and stupor. Death occurred Dec. 12th.

NOTANDA. General symptoms soon after injury; lymphangitis and one abscess

four days later; severe obstinate pain preventing sleep; multiple abscesses; diarrhœa; papulo-pustular rash; phlegmon of forehead; nasal involvement.

McCullough, Saskatchewan. The notes of this case are owed to Dr. J. G. Rutherford's kindness. Dr. McCullough was written to and permission was asked to make use of the case, but no reply was received before going to press. A man contracted glanders of the farcy type from his work horses. He recovered after four months of sickness, during which time about 50 abscesses on his legs and arms were opened. He wintered in California, returning home in the Spring to die of lung trouble.

The diagnosis of glanders was verified by Dr. Bell, Government Bacteriologist for Manitoba.

NOTANDA. The enormous number of abscesses opened; the apparent recovery; the death from pulmonary disease which was not improbably of a glanderous nature.

Grain and Ross, Manitoba. Notes of this interesting case were obtained through the kindness of Dr. J. G. Rutherford, Veterinary Inspector General for Canada.—Dr. Ross, in whose charge the case was, was written to by the writer, permission to use the notes being asked, but no reply was received.

A farmer, aged 22, had for some months had the care of a horse with constant nasal discharge. He had, however, been away from home for several weeks previous to Aug. 20th, 1905. On this date, as the nasal discharge was unusually profuse, he closely examined the horse, particularly its nostrils and mouth. Doubtless infection took place then. On Aug. 22nd, he began to feel unwell, though still able to work and eat a little. On Aug. 23rd, he was much worse, complaining of pains in the region of the back and hip-joints.

His malady increasing, Dr. Ross was called in on Aug. 26th. At that time the case was diagnosed as probable typhoid fever, as there were no external manifestations suggesting glanders. On Sept. 3rd, however, a large, hot, painful nodule appeared on the forehead. On Sept. 4th and 5th the nodules increased in size and number, appearing on the legs, chest and arms simultaneously. On Sept. 6th they became pustular and later formed ulcers. The nostrils now became ulcerated and discharged a viscid, gluey material. Ulcers appeared on the eyelids. Owing to the ulcers and the viscid, adherent discharge from them, one eye was completely closed. Ulcers also appeared around the lips. Glanders was now suspected and after a visit to the stable to see the horse affected, this diagnosis was definitely made. The patient died on Sept. 8th, literally covered with pustules and ulcers. The diseased horse reacted to Mallein.

NOTANDA. Period of incubation, definitely two days; typhoid-like onset without local signs, lasting 12 days; period of eruption and nasal discharge and ulceration lasting five days.

Robins and Bell, Quebec. Present paper.

THE writer desires to acknowledge most gratefully the debt he owes to all those who by giving kind and helpful advice, or by imparting valuable information have contributed so largely to anything of interest which this study may contain.

He is indebted to Dr. James Bell, under whose care our own patient was while in Hospital, for kindly furnishing him with notes of the case during that time. It was at Dr. J. G. Adami's suggestion, and with his encouragement, that this work was undertaken, and his help in planning the general outline of the work and his advice as to the surmounting of specific difficulties encountered in carrying it out, have

been deeply appreciated and are here gratefully acknowledged. He would also acknowledge his indebtedness to Dr. C. F. Martin for his helpful suggestions as to the method of carrying out the work.

The compilation of anything readable on equine glanders in Canada would have been an impossible task for the writer, had it not been for the valuable literature and the still more valuable fund of personal experience which Dr. Rutherford, Veterinary Inspector General for Canada, so generously and so heartily put at the disposal of one who was a perfect stranger to him. Not only did Dr. Rutherford do this, but in addition, unasked, he set on foot inquiries which resulted in the discovery of two of the most interesting cases of human glanders in Canada that have yet come to light, and sent notes of these cases to the writer, who can only express his deep appreciation of all this great kindness.

Grateful acknowledgment is also due to Dr. C. H. Higgins, Government Pathologist to the Department of Agriculture, who kindly showed the writer around his thoroughly equipped laboratories and gave him the valuable information herewith included as to the manufacture of mallein.

To the Medical Board of the Montreal General Hospital the writer desires to tender his hearty thanks for the courteous permission afforded him to make use of cases of glanders that had occurred in that Hospital.

Finally, to all friends who have been keeping watch for cases likely to prove of interest for purposes of this paper the writer wishes to express his sincere appreciation of their kindness

INDEX