

## THE IMMUNISATION OF HORSES FOR THE PREPARATION OF DIPHTHERIA ANTITOXIN.<sup>1</sup>

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It is my intention to describe to the best of my ability the method employed in the immunisation of horses for the preparation of diphtheria antitoxin, and also to describe the process of bleeding these animals when immune. I find that suitable horses of the heavy draught class can be purchased for prices varying from £3 10s. to £7. The animal is, in the first instance, placed in an isolation box, where it is tested with mallein (generally twice), then with tuberculin, and if the test is negative it is placed amongst the other horses. The seat of inoculation which I find most convenient is just in front of the shoulder; this part is easily accessible in the horse, and the operator is less liable to be kicked by the animal. Previously to inoculation the syringe &c. are boiled for fifteen minutes and the part washed with ether and then with a solution of carbolic acid (1 in 20). The syringe, with needle affixed and charged with toxine, is then held in the right hand and a fold of sterilised skin pinched up with the left, the needle inserted, and the piston pushed gently home. As a rule the horse stands quietly enough and seldom exhibits any symptoms of pain or uneasiness during the inoculation. In commencing the immunisation of an animal very small quantities of the toxine are used at first, the initial dose being generally 1 c.c. In the case of the first horse experimented on I used toxine mixed with Gram's solution of iodine, but this method was soon discontinued, as it was found that the solution of iodine acted as an irritant and caused local swelling slow of absorption. The local lesion following the first inoculation is, as a rule, well marked and appears in the form of a diffuse soft swelling slightly painful on pressure. This swelling reaches its greatest height in from six to seven hours after inoculation, generally persists for two or three days, and then disappears. Coexistent with the local lesion we generally get a rise in temperature. This rise reaches its maximum in from six to seven hours after inoculation—that is to say, at the same time at which the local swelling is greatest—and generally falls to normal in thirty-six hours. When the local lesion has disappeared and the temperature fallen to normal the dose of toxine is repeated, and if this produces very little local or general effect it is raised by degrees, thus: primary dose, 1 c.c.; then after a week has elapsed, 1 c.c. again; then 5 c.c.; then 10 c.c.; then 10 c.c. again; then a rise to 25 c.c., and so on. When the dose has reached 50 c.c. we give the horse this quantity three times a week for a fortnight, and if the animal stands this amount without any reaction the dose is raised to 100 c.c. three times a week for the same length of time, and then 200 c.c. at the same intervals. The period of time allowed to elapse between each inoculation varies with different animals, and we take as a guide the local swelling and the temperature, as the inoculations are discontinued until both have subsided.

The above is the outline of the method of immunising horses, but I have noticed a few facts in connexion with the above remarks which are of some interest, but which are of a somewhat disjointed nature. No two horses are alike in their power of resistance to the action of diphtheria toxine. I have had an animal under my charge which received 10 c.c. toxine, and the day after received 100 c.c., and this without producing any very marked effect; while in another case the initial dose of 1 c.c. produced a violent local and general reaction, and after an interval of a fortnight a second dose of 2 c.c. caused paralysis of the hind quarters and the animal had to be destroyed. The same toxine was used in both cases. Again, in some animals the local lesion in the neck disappears twice as fast as in others, using the same toxine in both cases. The rise in temperature following inoculation is also very variable. I have a record of a

horse whose temperature during the whole process of immunisation never exceeded 103° F., and I have a record of another horse also immune who after every inoculation had a rise in temperature, in one case exceeding 105°. Amongst all the horses I have inoculated, even when the temperature was very high, I have never known one to refuse its food; but I have noticed that following on a large dose of toxine some animals have a fit of shivering and exhibit distinct rigors. In a very few cases—four out of many hundreds of inoculations—I have seen necrosis of the skin to follow inoculation. The skin over the swelling becomes brown and hard, and on falling off leaves a glazed red surface; this, however, soon heals under a boracic acid dressing. When the horse is considered to be sufficiently immune it is allowed to rest for a clear week from the last inoculation before being bled. The vein from which we bleed is the jugular vein found on the side of the animal's neck lying in what is termed the jugular furrow and separated from the skin by the panniculus carnosus, that sheet of muscular tissue stretching subcutaneously over the upper part of the horse's body. The part over the vein is first shaved and then washed thoroughly with ether and carbolic solution (1 in 20). The vein is then raised by pressure with the fingers, and with a scalpel a small incision about half an inch in length is made through the skin and panniculus carnosus.<sup>2</sup> On separating the edges of the wound with a pair of forceps the vein can be observed at the bottom of the incision. The cannula, after being connected to the Kitasato flask by a piece of quarter-inch rubber tubing, is taken in the right hand, the vessel is raised with the left and the tube inserted, care being taken that the stream of the vein is not interfered with. The blood then flows freely, and when the flask is sufficiently full it is replaced by an empty one as follows. The rubber tube is pinched by the fingers of the left hand and the full flask withdrawn and handed to an assistant to plug. The empty flask is now taken in the right hand, the long glass tube is placed in the end of the rubber piping, the constricting fingers are withdrawn, and the blood flows.

As regards the amount of blood which can be removed from an animal with impunity, that of course varies with size. The amount I generally take is ten litres, but I have removed as much as sixteen litres without any injurious effect to the horse; this is not to be wondered at, seeing that one-sixteenth part of the animal's body weight is blood. The reason why I do not as a rule draw off more than ten litres at a time is that if more is taken I find the last four or five litres over the tenth do not clot properly, and the serum which separates is of a pink colour. As soon as the blood is firmly clotted it is advisable to twist the flask in the hand, so as to separate the clot from the walls. When sufficient blood has been drawn off I press on the vein anterior to the cannula and withdraw the tube. I then sponge gently with carbolic solution (1 in 20) and fasten the edges of the wound with two catgut sutures. The wound is now dusted with iodoform and covered with a piece of sterilised wool dipped in collodion. I have never had any difficulty in stopping bleeding, and the wounds have always gone on satisfactorily. The veins are in no case obliterated or obstructed, and in one horse which has been bled fourteen times the vessel is just as pervious as in any other animal.

It is hardly necessary for me to state that all instruments &c. are boiled for half an hour previously to an operation. As regards methods of restraint in this operation, these of course depend upon the animal, but I have usually found horses stand quietly enough when being bled. I should like to say a few words about the flasks in which the blood is collected and the method of decanting the serum. The flasks are ordinary Q-like filtering flasks fitted with a rubber cork and two pieces of glass tubing, one of wide calibre to allow escape of air, the other of narrower dimensions, over the orifice of which is slipped the rubber tubing, connected to the cannula. These flasks are sterilised for three hours on three separate occasions. When the flasks are full and the blood has been twisted on, clotting they are placed in a cool cellar, and in twenty-four hours' time a large amount of serum will have separated. The branch tube of the flask is flamed in a spirit-lamp, the wool plug removed, and the serum poured off into sterilised

<sup>1</sup> A paper read before the Pathological Society of London on March 19th, 1895.

<sup>2</sup> At first the cannula was inserted directly into the vein through the skin, but afterwards it was found to be more satisfactory to make a small incision.

Winchesters. The branch tube is now wiped free from serum by repeated pellets of sterile wool, and it is finally replugged. As a rule, a two-litre flask of blood yields one litre of serum, but some horses' blood does not yield anything like that amount.

Sudbury.

## AN UNUSUAL CASE OF MULTIPLE HERNIA WITH HYDROCELE; STRANGULATED FEMORAL HERNIA; OPERATION; RECOVERY.

By ETHELBERT COLLINS, L.R.C.P. LOND.,  
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THE patient, a man aged sixty-five years, had on the right side a complete inguinal hernia and a femoral hernia, and on the left side an incomplete inguinal hernia. There was also a hydrocele of the right tunica vaginalis. According to the patient's statement both inguinal herniæ appeared about ten years previously, and were caused by lifting heavy weights; he was, however, uncertain as to the duration of the femoral hernia. The hydrocele had existed about six years, having been regularly tapped twice a year. On the morning of Jan. 4th, 1895, I was summoned to this case "as one of the man's ruptures had come down, and he was unable to get it back." When I saw him (about three hours after his rupture had come down) he presented the symptoms of a case of strangulated hernia, he had vomited several times, there was distressing hiccough, and pain in the region of the hernia and at the umbilicus. On examination I found that the femoral hernia was strangulated; it was about the size of a large walnut, tense, hard, and there was no impulse on coughing. I was unable to reduce it. I again saw the case in the afternoon with my brother, Mr. J. B. Collins, and we agreed to operate. After the patient had been fully anæsthetised I again tried to reduce the hernia, but was unsuccessful. Having first tapped the hydrocele, which was rather in the way, as it contained twelve ounces of fluid, I proceeded to operate in the usual manner. The sac was excessively thick, and contained a small quantity of clear fluid and a knuckle of intestine; it was tightly gripped in the femoral ring. After making a few notches in Gimbernat's ligament the gut was easily returned. I then ligatured the sac with carbolised silk and removed it, closed the wound, and dressed it with sal alembroth gauze and wool. Carbolic acid was used during the operation, and all the antiseptic precautions it was possible to take in an ordinary cottage were observed. The patient made an uninterrupted recovery, no rise of temperature or any unfavourable symptom occurred, and he was able to leave his bed on the twelfth day after the operation with the wound perfectly sound. On Feb. 11th he was in good health and, wearing a suitable truss, was walking about as usual.

I quote this as being an unusual case of herniæ complicated with hydrocele. I cannot recall a case of double inguinal hernia and a femoral hernia in the same subject, leaving the hydrocele out of the question. Of course, it is not surprising that the femoral hernia should have become strangulated, as the man was wearing a double inguinal truss—which he had obtained from some quack—leaving the femoral hernia to take care of itself. Before I ventured to record this case I sought the opinion of my friend and former teacher, Mr. C. B. Lockwood, as to whether he considered it worth publishing. His large experience and original work on this subject, together with his concordance with my views, form my excuse for doing so. I may add that Mr. Lockwood suggested that the man had an abnormally long mesentery, which might account for his several herniæ, and certainly the shape of his abdomen would indicate that he has, it being flattened above and bulging below. I am indebted to my brother for his valuable assistance, to which I largely attribute the success of the operation.

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## Clinical Notes:

### MEDICAL, SURGICAL, OBSTETRICAL, AND THERAPEUTICAL.

#### SUPERNUMERARY MAMMA IN A MAN.

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WHEN I was at the Kashmir Mission Hospital last summer a Hindu pundit aged about thirty-five came to me for some gastric ailment. When about to examine his abdomen I noticed a tumour above the left hip. This proved to be a fully developed mamma, as seen in the accompanying engraving, which is from a photograph taken at the time. In consistency and appearance it was exactly



like the mamma of a virgin. The nipple was small and rather flattened, but the areola was perfect. I was unable to express any milky fluid. The man told me that it had developed at the time of puberty and never gave him any annoyance. He, therefore, did not desire its removal. His proper nipples on the chest were quite normal, and I detected no trace of other abnormalities. I believe the position, though not the commonest, is not unusual for supernumerary mammae, but its large size and the fact of its occurring in a man seem to me to make this case worthy of record.

C.M.S., Bannu, N. India.

#### SINGULAR COMPLICATION OF DEATH FROM DROWNING: IMPACTION OF A PIECE OF COKE IN THE LARYNX.

By WILLIAM EVANS, M.R.C.S., L.R.C.P. LOND.

THE following case is perhaps worthy of being recorded on account of the remarkable circumstances attending it. A boat containing six persons was capsized in the river Thames, near Wandsworth Pier, on Bank Holiday (Aug. 5th), and two of the party lost their lives. The body of one of them, a man aged about twenty-one years, was recovered on Aug. 9th, and I made a post-mortem examination on the following day. Having opened the chest, I observed that the lungs were not distended and nearly overlapping the heart, as is usual in death from drowning, neither did they pit on pressure. I removed the tongue, larynx, &c. complete with the lungs, and found a piece of coke firmly impacted in the larynx, the vocal cords grasping it a little below its centre.