

A STUDY OF THE ETIOLOGY OF PERIODIC OPHTHALMIA IN HORSES.

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Although the results of this study are negative, they narrow the field in which the cause of this disease is to be sought. Ordinary contagion is excluded, and the assumption raised that an organism causing it must enter the horse through some intermediary as does the malarial parasite; or the eye lesions is connected with some distant focus of disease, as in onchocercosis; or that the disease is metabolic in origin. Read before the St. Louis Ophthalmic Conference, May 14, 1920.

During the summer of 1916, periodic ophthalmia began to be prevalent among the horses of the British Expeditionary Forces. No. 19 veterinary hospital at Rouen was designated as one of the special hospitals for this disease; and it was there, thru the courtesy of the commanding officers, first Major Hodge and later Captain Stewart, that this study was made. Much of the work was performed by Captain Torrence and Captain Gofton, without whose aid this study would have been impossible.

The clinical picture identifies this epidemic with the disease described best by Bouley and Reynal¹ in 1862 under the name of "Fluxion Periodique."

When first seen by us, there was almost invariably marked photophobia, a red and swollen conjunctiva discharging profusely a mucopurulent secretion. The cornea was very hazy, in some cases being definitely opaque. This was due to an interstitial keratitis, there being no ulceration in any of the cases we observed. There was present marked circumcorneal injection and a plastic iritis, the pupil early being occluded, a gray or hemorrhagic exudate filling the pupillary space. Branching vessels extended 3 to 5 millimeters from the conjunctiva into the cornea. In every case where the vitreous could be seen, there were opacities. Both eyes were usually affected, one beginning about two weeks after the other.

Gradually the secretion would disappear, the photophobia and corneal opacity grow less and the eye become quiet. The keratitis practically always disappeared entirely. Vitreous opacities, occasional iris ad-

hesions and somewhat impaired vision were the obvious relics of the disturbance. The optic nerve was normal in the cases which we observed. Others have described optic atrophy and detachment of the retina. We did not observe either of these results in any of our cases. This, however, may be due to the fact that we seldom saw very late cases; as all such had previously been weeded out, and evacuated to areas further from the line than where we were stationed.

After six to twelve weeks these horses were returned to work. Tho we could not often follow the individual horse, we were able to determine that recurrences were common (usually in three to six months), each attack being worse than the previous one. The ultimate result was, in many cases, blindness.

We decided to confine ourselves to a determination, if possible, of the transmissibility of the disease.

The conjunctival secretion was examined by Dr. Eugene Opie and many organisms were found, chiefly staphylococcus aureus and a gram negative diphtheroid organism. This latter was isolated and unavailing efforts made to reproduce the conjunctivitis with it. The secretion from diseased eyes was placed in normal conjunctival sacs, but in no case was a conjunctivitis produced. The same experiment was repeated after making abrasions in the healthy conjunctiva, but with negative results.

Thinking that possibly the disease was acquired from occupancy of an infected stall, two healthy horses were kept for two months in stalls which had been used for many weeks for horses infected with ophthalmia. The

disease did not develop. On the other hand one horse which had been isolated in a clean stall for two months while in the hospital for pneumonia did develop ophthalmia.

Aqueous and vitreous humors, obtained aseptically from diseased eyes, were found sterile. Agar-agar, blood serum agar, glucose, gelatin and bouillon were used. Anaerobic cultures also were tried unsuccessfully. Aqueous fluid showed red blood cells; and in one specimen a coccus, probably a contamination. No organisms were seen by dark field illumination. Aqueous from acute cases was introduced into the anterior chambers of two horses. One horse was kept under ideal conditions and the other was kept in a foul, ill-lighted stable. Altho, in the latter case, certain changes were noted and the recovery was much less rapid than in the former, we could not say that the disease was reproduced. This is contrary to the findings of R. Avery,² who reports transmission of the disease in this manner.

In four cases, pieces of irides were removed aseptically from ophthalmia cases, and placed in the anterior chamber of healthy eyes. Reactions, suggestive of the disease, but not typical of it, were produced.

Blood was withdrawn from the jugular vein of two horses with the disease and cultures were made on agar and glucose and bouillon. Nothing grew from either specimen.

Fifteen cc. of blood were taken from a horse with ophthalmia and inoculated into the jugular of a well horse with no result. Thinking that perhaps an insufficient amount of blood had been used, two further transfusions were made, one of 50 cc. and one of 75 cc., each case being taken from a different horse with the disease and inoculated into a well horse. The disease was not reproduced.

Hoping that the blood might show something when examined, fresh specimens were studied but revealed no abnormalities.

A differential count with hematoxylin and eosin stain gave:

Polymorphonuclear neutrophilic
leucocytes87=60%
Large mononuclears18=12%
Small mononuclears32=24%
Poly. eosinophil. nuclears..... 7= 5%

In one experiment of transplanting iris, we were pleased to find that the iris came freely off from the lens capsule and hoped that in old quiet eyes when the pupil was occluded, an iridectomy might give useful vision. Altho we were able to perform the operation successfully in a few cases, we invariably found that the vitreous was so full of opacities that no visual improvement was obtained.

We used at different times three treatments.

1. Lugol's injection.
2. Subconjunctival saline injections.
3. Atropin and silver nitrat.

Captain Torrence tried, in a series of cases, the procedure of Wiggs,³ of injecting Lugol's solution deep into the orbit, but on the average the improvement was no greater in the eyes so treated than in the control eyes. Subconjunctival injections were tried in twenty cases, 5% saline being used, but no marked benefit was noted. We found the most effective treatment to be the early and prolonged use of atropin and silver nitrat.

Autopsies were made on a small number of horses having this disease. Only one showed pathologic changes in parts other than the eyes. This one had pus in the nasal accessory sinuses. One horse had spinal disease clinically but there was no change in the gross specimen, pathologically.

In conclusion, we believe that our work presents a certain amount of evidence against the theory of direct contagion in this disease.

CASE HISTORIES.

October 1, 1917, to November 15, 1917. Two horses with normal eyes were placed in ophthalmia wards where they were in stalls previously occupied by horses with ophthalmia and were in flank contact with horses which had active forms of the disease. One horse was exposed thus for five

weeks and the other for six weeks. The disease did not develop.

EXPERIMENTS WITH AQUEOUS FROM INFECTED EYES.

February 11, 1918. 1 c.c. of aqueous obtained by puncture thru the cornea near the limbus with a hypodermic needle in a case of acute ophthalmia, was introduced into the anterior chamber of a normal horse "A" which was then placed in a well lighted, well ventilated stable.

1 c.c. from same case of ophthalmia was placed in the anterior chamber of a normal horse "B" which was placed in a dark foul stable.

February 12, 1918. "A" Slight general steaminess of cornea, most marked around puncture wound. Photophobia and lacrimation. "B" Same as "A." February 13, 1918 "A" Less steaminess of cornea and no other signs of disease. "B" Increased steaminess of cornea. Small amount of blood in lower half of cornea and three flocculi in anterior chamber below pupil; marked photophobia and lacrimation. February 14, 1918. "A" Very slight corneal steaminess, no photophobia, slight lacrimation, conjunctivitis. "B" Increased and now marked conjunctivitis, lacrimation, and photophobia. Pupil narrow, reacts only slightly to light, aqueous muddy below lower pupillary margin, containing small flakes of albumin, very little hemorrhage (less than on the 13th). Slightly less corneal clouding. No vascularization of cornea. February 15, 1918. "A" Well. "B" Conjunctivitis, lacrimation, and photophobia less. Precipitate in anterior chamber is higher, and now appears as a jelly-like mass which can be moved freely about in anterior chamber by pressure on the cornea. Less steaminess of cornea and condition looks less like ophthalmia. February 17, 1918. "B" Only slight corneal steaminess and the precipitate in anterior chamber remain as abnormalities. February 26, 1918. "B" Still small amount of precipitate in anterior chamber. Eye quiet. Vitreous clear.

IMPLANTATIONS OF DISEASED IRIDES.

These experiments were performed under ether anesthesia.

EXPERIMENT 1. January 19, 1918. Iris from acute case of ophthalmia introduced into the anterior chamber of a normal horse thru linear incision, left eye. Much bleeding. January 22, conjunctiva slightly injected. Mucopurulent discharge from inner canthus. Iritis. Upper one-third of inflamed iris can be seen. Pupil and remainder of iris obscured by hyphemia. Pupillary slit distinctly seen, appears to be closed. January 23. Hyphemia rapidly disappearing. Pupil visible and slit like, but nature of vitreous not discernible. Less discharge and less photophobia. Appears today less like a developing ophthalmia. January 24. Less hyphemia. Pupil visible, narrow. Corpora nigra has increased in size and extends almost across pupil. Probable fibrinous exudate in lowest part of anterior chamber with blood above it. Vitreous cannot yet be seen. January 25. Steaminess around outer rim of cornea extending 5 mm. towards center. Slight circumcorneal injection and definite fibrinous exudate in anterior chamber. Less hyphemia. Pupil more contracted. Contents of vitreous chamber cannot yet be seen. January 27. Steaminess of cornea limited strictly to periphery. Appearance as of the 25th. Three pigment deposits on anterior lens capsule. Cannot make out condition of vitreous. January 28. Injection in region of scar more marked. Inflammation decreasing. Pupil more open. Structure of retina distinguishable, but slightly hazy. January 30. Pupil reacts to light. Structure of retina fairly clear. Disc appears as a pink blur. Whole condition looks less acute. Peripheral cloudiness about gone. Only slight injection remains and this near the scar of the incision. February 1. Whole eye better. Pupil much more dilated, reacts actively to light. Optic disc a pink blur and vessels difficult to distinguish. Three pigment spots on anterior lens capsule. February 3. No change. February 4. Iris smoother

and paler than normal, but much of its lustre has been regained. Retinal vessels still hazy. February 5. No change. February 9. Today there can be seen a definite vitreous haze composed of minute particles, lying for the most part anteriorly and in lower half of vitreous. This accounts for haziness of vessels of disc. February 14. External appearance normal.

EXPERIMENT 2. January 18, 1918. Piece of iris from an acute case of ophthalmia was inserted into the anterior chamber of right eye of a normal horse. (Keratome incision, aseptic operation, ether.) January 30. Foreign iris can be plainly seen on the iris close to the scar. There are a few blood clots and there is cloudiness of the cornea in the immediate vicinity of the incision. Pupil narrow and details of retina cannot be made out. Iris looks normal. January 31. No change. February 1. No change. February 2. Cloudiness of cornea much less marked in the region of the introduced iris and only one very small blood clot unabsorbed. Photophobia marked and fairly profuse flow of mucoid material from conjunctiva. Normal retina can be distinguished thru a narrow pupil which reacts to light. February 3. Photophobia more marked. Secretion as yesterday. Conjunctiva swollen and injected. Whole iris seems affected, presenting fawn colored appearance with loss of the crypts. Pupil does not react to light. April 2. Photophobia, lids swollen, mild iritis. Retinal structure fairly clear. Edge of optic disc can be seen and vessels are a little hazy. Pupil reacts to light and the general appearance of the eye is

better. May 2. No change. Discharge continues. July 2. Better, less conjunctivitis and discharge. Iris normal, reacts actively to light. Corneal opacity around introduced pieces of iris almost gone. September 2. Except for slight inflammation of the conjunctiva and slight photophobia the eye is normal.

EXPERIMENT 3. January 29, 1918. Piece of iris removed from an acute case of ophthalmia was introduced into the anterior chamber of a normal horse. Ether. January 30. Blood clot hanging around corpora nigra. Pupil contracted. Iris has lost its lustre. Marked cloudiness around scar. January 31. Peripheral keratitis with injection around scar. Pupil contracts. Retina seems normal but only a poor view is obtained through the contracted pupil. February 1. One end of clot has become detached from corpora nigra and is stretched across the pupil. Cloudiness of cornea seems to be extending centrally. February 2. Remains of blood clot lying in deepest part of anterior chamber. Peripheral opacity of cornea less marked. Retina normal. Very sluggish reaction of pupil to light. February 3. Peripheral cloudiness remains; this may be due to a small tag of implanted iris remaining in the lips of the wound. Structure of retina clear except for a slight haziness of vessels around the disc. Pupil reacts readily to light. Whole eye much improved. February 4. Still some injection and cloudiness around incision. February 5. Same as on 4th. February 7. Better. Peripheral steaminess gone. Slight general corneal haze. Injection about incision almost gone.

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