

THERAPY OF ESERINE

Herbert R. Groome

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Physostigma, calabar or Ordeal bean is of vegetable origin, its natural habitat being Calabar and region of the mouth of the Niger in West Africa. The parts used are the bean or seed, which is chocolate brown with a broad black groove extending over the entire length of convex edge. The principle constituent of the bean is the alkaloid, Physostigmine or Eserine. There are also the alkaloids Calabarine, a product resulting from the composition of Eserine, and similar in action but weaker; and a neutral principle Physosterine resembling Cholesteroline.

The official preparation are the fluid extracts and tincture of Physostigma, but Physostigmine is most used in Veterinary practice. The forms are the Salicylate and Sulphate, the former being most used as it is more readily dissolved. It is usually given intravenously or subcutaneously.

ACTIONS

Eserine belongs to that class of drugs which depress the inferior Cornuæ.

ALIMENTARY TRACT:-

The flow of saliva is at first stimulated, but salivation ceases when the gland is deprived of blood by vascular contraction. The peristaltic action of stomach and bowels is increased by direct local action of alkaloid on the muscles or ganglia of their walls. The secretions of digestive tracts are augmented with the expulsion of considerable mucus per rectum. When Physostigmine is given to the horse, under the skin, within the trachea, or intravenously, defaecation and expulsion of gas per rectum commonly occurs in space of half an hour or a few minutes and often of large amounts.

CIRCULATION:-

Eserine is readily absorbed but exerts no influence on the blood. Moderate doses render the Cardiac pulsations slower and more forcible and increase vascular tension. Large toxic doses caused the heart ^{to beat} more rapidly and less forcible.

NERVOUS SYSTEMS AND MUSCLES:-

The essential physiological action of Eserine consists in depressing the cells of the inferior Cornua. The involuntary muscles throughout body are stimulated, including those of stomach, intestines, bronchial tubes, heart, spleen, uterus, bladder and iris.

RESPIRATION:-

The respiration is not disturbed by medicinal doses. Toxic quantities at first quicken and then retard the respiratory movement, and death occurs from asphyxia before cessation of heart.

SECRECTIONS:-

Secretion is generally increased including that of the salivary, gastric intestinal, sudoriparous and lachrymal glands.

Eye:-

Eserine is a myotic applied locally or administered internally. In all probabilities, contraction of the pupil is brought about by stimulation of the oculomotor nerve endings, simultaneously with paralysis of the termination of the sympathetic nerve in the iris.

ELIMINATION:-

Eserine is rapidly absorbed and eliminated, ~~mainly~~ by urinary tract but also in other secretions.

With the foregoing knowledge ^{of} Eserine, a number of experiments were performed by using drug on cases in which it seemed indicated and a careful record kept of actions and results.

Subject 1.

A sorrel mare, 7 years of age, in good condition and running on alfalfa. On Saturday P. M. April 13th., animal noticed to be unable to see objects before it, so was taken out of pasture by owner and eyes examined, but found no inflammation, though pupils were widely dilated. Owner bathed patient's eyes with warm salt solution and a light blister was applied below inner canthus of each eye. On following Monday, owner brought animal to hospital to be examined. No lesions were found. Pulse and temperature normal. The diagnosis was that animal had eaten something that acted as a mydriatic.

A solution of Eserine of one grain to one ounce of water was prepared and ten drops of solution were injected into left eye at 3:30 P. M. and at 3:45 the same amount was injected into right eye. At 4:15, there was no change in either eye, so a second injection of ten drops was made into left eye. At 4:20, left eye was observed to be slightly less dilated than before commencing treatment. It was decided to treat only one eye and make comparison of results. At 4:45, left eye was observed to be only about two thirds the dilatation as before treatment, while right eye was about five sixths its former dilation. About twenty drops of solution were injected into left eye at 4:50. At 5:00 P. M., the left eye was only one third and right eye two thirds the dilation as before treatment. At 5:15, left eye more dilated than normal, while right eye was about the same as at 5:00 P. M. At 6:00 P. M., the pupil of left eye apparently normal while right eye was about the same as before. At 7:00 A. M. the next morning, pupils of both eyes again widely dilated, having worn off the effect of drug during the night. At 7:20, an injection of twenty drops of the solution were made into the left eye. At 7:45, left eye nearly normal so twenty drops more of the solution was used. Right eye unchanged so at this

time the same amount of solution was used in it. At 10:15, left eye contracted slightly more than normal, while right eye was about one third the dilatation as before using drug. Fifteen drops were now injected into right eye. At 12:00 M., left eye normal and right eye slightly dilated. 1:00 P.M., both eyes apparently normal. 2:00 P.M. both eyes again dilated about one third the amount as before treatment. About twenty drops of solution used in both eyes at this time. 4:00 PM. left eye normal, right eye slightly dilated. 5:30 P.M., both eyes apparently normal and animal able to see horses in lot and animals in pasture near by. Wednesday, 7:15 A.M., pupil of both eyes dilated to about the extent as before treatment. Used in each about twenty drops of solution. At 8:30 A.M., both eyes apparently normal. 1.00 PM. pupils of both eyes again widely dilated. In each about twenty drops more of solution was used at this time. At 3:00 P. M., both eyes apparently normal and subject able to see other horses and detect objects before him. At 6:00 P. M., the pupils of both eyes again dilated to twice their size. Thursday, 7:15 A.M., both pupils widely dilated so used about twenty drops of solution. At nine A. M. pupils of both eyes apparently normal. At 1:00 P.M., pupils of both eyes dilated to twice their normal size. Used about twenty drops of solution as previously. Owner took patient away from hospital on Friday A.M. with condition of animal about the same as before treatment. During all this time, pulse and temperature were normal, appetite of animal good and no cause could be accurately given for the trouble. Owner reported about one week later that animal had become paralyzed and unable to stand in stall. Further outcome of subject not reported.

Subject 2.

A horse, eighteen years of age, in good health except to injury to one hind limb which made animal useless. Temperature, 100.4 pulse, 40. At 4:15 P.M., two grains of Eserine injected subcutaneously in neck. At 4:30 P.M., Dribbling of saliva; 4:40, increased parastaltic action which could be heard several feet from animal, with signs of uneasiness. 4:45, considerable flatus passed which continued at irregular intervals of about three minutes. 5:25, animal passes a copious amount of faeces. 5:40, a second amount of faeces passed which was covered with mucous. Pulse 48, temperature, 100.4, saliva dribbling from corners of mouth. 5:50, a third passage of faeces, consisting of seven balls. Animal not watched longer but next morning the stall contained a more than normal amount of faeces. Temperature and pulse normal, and animal showed no ill effects of cathartic.

Subject 3.

A grey horse, eighteen years of age, in good condition. Owner found animal sick in the morning when he went to feed. Animal very uneasy, breathing hard, and had been rolling. Patient showed signs of emesis. At 11:00 A.M., Horse was brought to hospital and examined at 2:00 P. M. Peristaltic action was dormant, pulse 66, temperature, 101. Animal showed stiffness, mucous membrane of eye highly injected expression was that of intense pain. Diagnosed as impaction of the bowels. Gave animal one ounce of eucalyptolin, one dram of nuxvomica and one ounce, nitrous ether. 3:30 P. M., animal had broken out in profuse sweat with pulse at 96 per minute. Gave one grain of Eserine subcutaneously. 4:00 P.M., animal quite restless, some parastaltic action. Heart beat fast and weaker with no sign of passage from bowels. Animal grew gradually worse, and at 4:30 was down and unable to rise, dying about 5:00 P.M. Post mortem revealed a rupture, four inches in

length, in cardiac portion of stomach. Abdominal cavity filled with contents from stomach.

Subject 4.

Grey mare, five years of age with colt nine days old. Previous to day of sickness, was fed on dry feed without exercise. on day of sickness was driven nine miles into dountry and at noon refused to eat, lying down in stall and shows signs of pain. Was driven back to town, arriving at hospital at 7:30 P.M., when patient was showing intense pain. Pulse and temperature nearly normal. Owner had previously administered a small dose of Watkins liniment. Gave animal two ounces of eucalyptolin per/orum and one grain of Eserine subcutaneously at eight oclock. In twenty minutes animal passed considerable flatus and at 8:30, a second dose of Eserine of one grain was given. At 8:40, animal had a passage of a large amount of faeces, which were quite dry and hard. Patient had two more passages by 9:00 P.M. and begun to show signs of easinass and recovery. Animal had a total of eight passages by 11:00 P.M. and the next morning was apparantly well, pulse and temperature normal.

Subject 5.

Bay mare, eighteen years of age, taken sick at noon after having been idle all morning. Had previously been at light work. Feed had been soaked corn and alfalfa hay. Animal brought to hospital for treatment at 2:00 P.M., pulse 48, temperature 100.4. Case diagnos- ed as impaction of colon. 2:55 P.M. one grain of Eserine given subcutaneously. Intestinal action quite dormant. 3:15, a second dose given of one grain as before. Considerable peristalsis was noted at this time. 2:20 P.M. passage of considerable flatus. 4:20 P.M., passage of mucous and a single ^{ball} of faeces, covered with mucous. Considerable flatus was passed at quite frequent intervals. Stomach tube was

passed but nothing could be drawn from stomach, which helped to substantiate the diagnoses as that of impaction. 5:00 P.M., gave animal one and one-half grain of pilocarpine subcutaneously. 5:15 P.M. passage of a single ball of faeces. Peristaltic action was quite vigorous and animal showed continuous signs of uneasiness but retained a lying position. 5:20, a watery discharge from the bowels followed by several balls of faeces, which were quite hard. Animal emitted excessive salivary secretion from mouth. Pulse had risen to 72. At this time the passage of faeces became quite frequent and was accompanied by a copious watery discharge from bowels, faeces being very soft and in large amounts, continuing in this way until about 6:30. During all this time, flatus was passed at more or less frequent intervals also driveling of saliva from mouth. 6:45, pulse 40, temp. 100.4. The following day, animal's pulse and temperature was apparently normal but patient seemed quite sore when abdomen was manipulated and seemed quite indisposed to move around, but on second day was discharged from hospital as well.

Subject 6.

Large, bay horse, five years of age, weighing 1600 lbs. Had been at hard work but was in good condition. Was fed corn and prairie hay but on night previous to sickness, was given alfalfa hay. Was called to see animal and arrived at 2:15, about thirty minutes after the animal had taken sick. Animal in considerable pain and rolling. Diagnosed as ^Pimpaction of colon. Gave one grain of Eserine subcutaneously and one ounce of turpentine, one ounce of eucalyptolin and one ounce of nitrous ether per orum. 2:35 P.M. gave second dose of Eserine, one grain, subcutaneously. 2:40 P.M., animal passed considerable flatus, was quite uneasy and rolling continually. Temperature and pulse normal, peristalsis was quite vigorous. Animal walked

by owner, and at 3 P.M., gave one ounce of turpentine in one pint of oil. At 3:10 P.M., passage of a small amount of faeces, which were quite soft. From 3:15 to 3:45 P.M., animal had six passages of soft faeces but not very much at a time and after having these passages, became easier. Flatus was passed at frequent intervals from 2:40 until 4.00 P.M. Left animal at 4:00 P.M. and owner reported next morning that animal recovered rapidly after 4:00 P.M. and at 6:00 P.M. was apparently well.

Subject 7.

Animal, an indian pony, twenty three years old, and weighing not over 800 pounds. Had been noticed slightly ailing the day before and at 3.00 A.M., the day I was called, owner was awakened by animals rolling and violent efforts in barn, but he did not do anything until 7:00 A.M., when I was called and found the animal quite violent, and rolling with pain. Trouble diagnosed as impaction and two grains of Eserine was administered per orum, with one ounce of turpentine, one ounce of ginger and two drams of nux-vomica. Animal bloated considerable. Temperature 101, pulse 60, rear bowel was empty, but vagina and rectum was quite balloned. At 8.00 A.M., gas passed at frequent intervals but animal seemed to get no relief from the continual pain and could be kept standing only with difficulty. At 8:30 A.M., gave one ounce of peppermint and one ounce of carsul per orum. Left animal until 10:00 A.M. and when I returned found animal apparantly in same condition as at 7:00 A.M., so gave one grain of Eserine in one pint of oil. At 10:30 A.M. passage of a single ball of faeces, which was quite dry, and from this time until 11:30 A.M. flatus was passed in considerable amounts and at quite frequent intervals and animal had eight passages of faeces, which ranged in from one to five pellets. At 11:45 A.M., animal had several passages

of faeces in copious amounts and rapidly became less restless and at 12 oclock was standing up with apparantly no pain. At 1:00 P.M. animal reported to be seemingly well and eating hay.

Subject 8.

Bay horse of about twenty five years of age, weighing 1100 pounds, had been changed from praire hay to first cutting alfalfa which contained considerable quantities of alfalfa that had been killed by frost. First noticed a little uneasy at noon, the day following the change of hay, but was driven a distance of twelve miles, during which trip he had several passages of soft faeces. At 5:00 P.M. when unhitched, hhe was quite uneasy and showed considerable abdominal pain. At 5:30 P.M., gave one grain of Eserine subcutaneously and one ounce eucalyptolin, one and one-half ounce nitrous-ether and one ounce of aromatic spirits of ammonia, per orum. Animal preferred to lie, and evinced pain by occasional rolling and kicking of hind feet. At 6:30 P.M. condition was no better, except that -at this time, he had a copious passage of faeces and had passed considerable flatus. Gave one grain of Eserine with one and one-half grain of pilocarpine subcutaneously. At 6:45 P.M., drivveling of saliva quite copious from mouth. Flatus passed frequently. 6:50 P.M., passage of four balls of faeces and at 7:15 P.M., he had a passage of like amount, and fifteen minutes later, a still larger amount. Gas continued to pass at quite frequent intervals and at 8:15 P.M. and 8:20 P.M., there occured other passages of faeces which were small in amount and quite soft. Animal appeared to be much easier and chose to stand, so was left for the night. On the next morning, patient was apparently well, two passages of faeces having been made during thenight.

Subject 9.

Cow, which had been fied on the same lot of alfalfa as horse in previous case, was quite bloated, but in very little pain

At 7:55 A.M., gave two grains of Eserine, subcutaneously, and a third grain was given, ten minutes later. At 8:10 A.M. animal began to belch considerable gas and repeated same at varied intervals of about five minutes. Visible motions of rumen could be detected against abdominal wall in region of flank. 8:20 A.M., belching increased and considerable dribbling of saliva. 8:30 A.M., distension was considerably decreased, due no doubt to the escape of gas by patient's frequent belching. After this time the belching became less frequent and at 9:00 A.M., size of abdomen was apparently normal.

It will be noticed that in case No. 2, subject was a horse in normal health, he being used as a check for action of alkaloid on healthy animals, while all other cases reported were those of acute digestive trouble, and with all save case, No. 3, the results are those which commend the use of Eserine. In case No. 3, the lesion of stomach is thought to have taken place before administering Eserine, so this fact removes all blame for results from action of the drug.

With the foregoing results from the use of Eserine, and other cases that I have observed, the efficiency of the alkaloid, in cases where a drastic purgative is not contra-indicated, is well proven.

Why should the busy veterinarian wait from twenty four to thirty six hours, for oil to move an ordinary case of impaction, when two grains of Eserine will move *very* obstinate cases.

I believe that Eserine will rapidly assume a place of vast importance as a curative agent, when properly used in veterinary practice.