THESIS
ON THE
DISEASES OF BONE CAUSING LAMENESS
BY
Frank P. Normington. '95

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The subject may seem narrow but when we consider that the subjects "Germ Theory of Disease", Inflamations, Fracture, Necrosis, Anchylosis, and Exostasis are all included, we see that it is a broad one, indeed, much too broad to do justice to in so short an article.

Germ Theory of Disease.

Experiments have shown that all fermentation is due to micro-organisms. The change of cider into vinegar, the growth of yeast, the decay of the apple, the souring of milk, are all accomplished by bacteria. Scientific investigation has shown that consumption, diphtheria, measles, etc., are due to the work of germs. While we cannot believe that all disease is the result of invasion of the economy by some germ, yet we are forced to believe that many of the ills of life that have been wrapped in mystery may be laid at the door of the microbe.

Medicine has always been considered a mysterious science. Medicines were given because of some mysterious property which they were supposed to possess in driving away disease. Now they are given to destroy the germ which produces the disease, and are also given because of certain known actions.

It may seem that this does not apply to bone diseases, but we must consider that the bones are often made fragile because of debilitating disorders or the presence of cancers; moreover there are germs that attack bone,---for example, attinimicosis and tubercular ostitis.

Inflamation.

This is an exceedingly important branch of our topic. Indeed, most diseases are either the cause or the result of inflamation. Nearly all the cases of lameness are due to the in-

flamation of some part, thereby causing pain. It has been variously defined by different authors. Williams defines it to be "a perverted nutrition of a living part, the effect of irritation or injury."

The fluid part of the blood, to nourish the tissues, must pass through the walls of the blood vessels. In inflamation this action is generally increased, the change of the ransuded liquor sanguinus is rapid, and the mode of growth is c changed. Irritation causes the production of lymph faster than it can be removed which causes an exudation. This inflamed condition generally causes pain due to the pressure of the nerves or to the stretching of them; the firmer the swelling, the more painful, thus the confined inflamation is more painful than that of outer tissue. This is well illustrated in inflamed bones and in laminitis.

As one would naturally expect, the increased amount of blood present causes a redness of the part. This increased amount of blood and the extreme activity of change in the part causes heat. This has been shown by experiments, though if one could but notice, he can easily detect the increased heat of the part.

Inflamation usually results in impairment of the part; the terminations are: restoration, suppuration, ulceration, and mortification, or in bone, necrosis. The treatment we shall omit until we come to the diseases themselves.

Exostasis.

Another very important action to be considered is that of exostasis. It is any unnatural enlargement or protrusion of bone. This seems to be an effort of nature to strengthen some weak part or unite two parts which are inflamed and thus cure the disease. For instance, it occurs in splint, ring-bone, and in the process of anchylosis. When even the periostium is injured and inflamation is set up or even an increased flow of blood, tissue is likely to be converted into bone. An inflam-

ation of a joint is apt to change the articular cartilage into bone and if this process goes far enough it results in anchylosis of the bones.

Anchylosis.

Anchylosis is defined to be the union of two or more bones of a joint so that they become as one, due to inflamation in the joint from disease, irritation, or counter-irritants. It is the process which the veterinarian tries to hasten in treating ring-bone or spavin. When the process of anchylosis is complete, the severe inflamation ceases and the horse uses the part without pain, though the motion is necessarily impaired.

Fracture of Bones.

Farcture is an accident that causes much pain and inconvenience and often terminates seriously, ending sometimes with death. So that it seems highly proper in this connection to consider it as a disease. Fracture is defined to be "solution in the continuity of bone", and due to some unusual stress. The fracture may be transverse, longitudinal, or oblique, and is known as: simple , compuond, comminuted, impacted and partial. The presence of a fracture may be diagnosed by the pain, inability to bear weight, the shortening of the limb, and crepitis or grating of the broken erds when manipulated.

The bones should be set as soon as possible and, since the process of healing is slow and the bones comparatively inflexible, the parts should on some way be secured against movement. If it is a limb, splints of various kinds may be used, of which probably poro-paster is one of the best.

The process of union consists of (1) an exudation of lymph, forming an elastic union; this is followed by a substance wh which resembles cartilage, called provisional callous; the third proces consists in changing the tumors of the provisional callous into bone and the formation of fibro-cartilage between the ajaccent surfaces, called the permanent callous; the fourth stage consists of the conversion of this fibrocartilage

into true bone which completes the welding process. It generally requires a year, more or less, for the absorption of this provisional callous and then the process is complete.

Having considered fracture, inflamation, and anchylosis, with exostasis, let us consider more more closely the subject lameness. The definition is,-"Lameness is the manifestation in the act of progression by any one or more of the limbs, of pain or weakness, inability or impediment." From this we see that lameness is not a disease, it is only the symptom. Hence we cure lameness by curing the disease of which the lameness is a symptom. A horse may have an anchylosed joint, or may have an exostasis that interferes with progression and yet not have pain; but as a rule the lameness is due to pain caused by inflamation or ulceration of a joint or injury to some of the tissues.

Splint.

This is a disease that may or may not cause lameness. We have seen that fibro-cartilage may change into bone, and this is what occurs in splint. The splint bones are situated on the inner side of the cannon bone and are connected to it by an elastic substance composed of cartilage and of fibre crossing each other diagonally. Hence the name splint. The splint may be the result of an injury causing inflamation of the part, but usually it seems to be an effort of nature to strengthen the part. It usually occurs in young animals which are overtaxed or strained in some way. The overtaxing of the part causes an increased action or even inflamation, the bones become anchylosed and we have a splint. Usually, however, the exostasis occurs as a lump at the place of union, about midway between the heel and pastern. Sometimes the inflamation and exostasis is limited to the fibro-cartilage and since this is insensible no lameness results. There may be quite a tumor formed and, if the periostium be not inflamed, the horse will go sound, but the periostium may become affected and the horse

go very lame especially when trotted.

Usually the splint causes lameness or the exostasis is so large as to be an eye-sore; it should not as a rule be treated. We cannot hope to convert the bone back into cartilage, but generally the exostasis may be reduced and the pain removed. The treatment resorted to is generally simple. The horse's leg may be placed in hot water for twenty minutes, three times a day day for four days. Percival recommends a counter-irritant in the form of a blister. His application is acetum cantharidum which is sponged off in eight or ten hours and every morning and night as long as there is a discharge from the blistered part. A good blister to drive away the splint is made by mixing one part of biniodide of mercury with eight parts of lard. If the exostasis is a large tumor, the covering may be removed and the tumor cut off with a fine saw made for the purpose. Periosteotomy is sometimes performed. The skin is cut through and then the periostium is slitted which relieves the tension. The blister accomplishes the same end as the last two operations and is les heroic.

Spavin.

Although the term spavin is applied to three ~~ages~~ diseases (bone-spavin, bog-spavin, and blood-spavin) we shall consider but the one, bone spavin. It is an exostasis on the antero-internal part of the hock, seldom if ever found on the outside, sometimes producing caries of one or more of the srticulatory surfaces and usually producing anchylosis. It is called either high or low, according as it affects the upper part of the joint or the head of the large matatarsal.

Some consider spavin as hereditary. In one sense this is so for many horses have a natural weakness of the hock which predisposes it to spavin. Some breeds are particularly subject to it while others appear to possess almast immunity. Percival believes in the existence of ossific diathesis in the system. Rapidly growing colts, especially if worked are likely to

suffer from this disease. The exciting causes are concussion of the joints and strains or sprains. Such work as backing heavy loads or galloping with a heavy load on the back are especially likely to produce spavin.

A spavin is detected by lameness and a lump or tumor the size of a walnut or larger. This tumor may or may not cause pain and pain may be present without the tumor. The lameness is peculiar in that it causes a rising and falling of the lump. The lameness may be caused by a stiffening of the joint from an exostasis or inflamation of the part, or it may be produced by severe pain from acute inflamation of the joint or else ulceration of the part. The lameness improves with progression, but if the horse be allowed to stand for a while, it is worse again. A spavin often causes themuscles on the affected side to become shrunken, the horse digs his toe into the ground and the toe of the shoe will be worn off, and in the stable, the horse rests foot on the toe, if both legs are affected, the horse rests first one and then the other.

In treating spavin we do not expect to restore the original tissue nor remove the exostasis. The aim is to hasten the process of the disease. When anchylosis has taken place, then the pain ceases and the horse goes comparatively sound. If the anchylosis takes place in the lower joint of the hock, almost no signs of lameness will remain, though if it be high the motion will be much impaired.

The line of treatment for this disease is counter-irritant; other methods are used but this is the principle to be pursued. First of all we must give the horse rest, this is the most important of all. Rest alone has been known to cure. Having secure rest for the animal, a common method is to fire and follow this with a blister. It makes but little difference what the shape of the iron is so long as it produces lines. As a rule the lines should be parallel and follow the course of the hair as this will leave lessof a scar. Firing for this disease should be severe, especially where other counter-

irritants have failed. As a rule the deeper the firing, the more likely it is to affect a cure.

For the first two days after firing there will be but little change, but the swelling will gradually increase and there will be found a sero-albuminous fluid of an orange color, exuding. About the fifth or sixth day pus will be discharged. This will increase in amount from day to day until general ulceration follows and the whole surface is raw, the swelling in the meantime growing less and less. Finally the stage of ulceration is followed by granulations and nature replaces the skin. As soon as discharges cease the part should be fomented and some oil used to keep the part soft.

A favorite remedy of some is the seton. It is a very serviceable remedy in periosteal spavin, but for articular spavin Percival considers actual cautery to be preferable. It is the common practice to pass but one seton and that from above directly across the tumor, thepassage of the seton on the other side of the hock which will greatly aid in producing anchylosis After passing the seton it should not be moved until sufficient inflamation occurs, after this it must be moved often enough to prevent the formation of absceses under the skin. While the seton is recommended only for periosteal spavin, yet it may sometimes be used in cases of articular spavim; for instance a horse that has once ben fired and yet gets lame. Herewe cannot fire again and a seton may affect a cure.

An action very similar to the seton is accomplished by the blister, though probably it is the least efficient of the th/ three methods. If a blister is to be used, it must be a very severe one. It may usually be applied three times, if this fails it is better to try something else. For a blister make an ointment containing bichloride of mercury and Venice turpentine, or biniodide ofmercury, one part to eight of lard. Another good blister is a mixture of equal parts of biniodide of mercury and cantharades one part of the mixture to eight of lard.

All these methods tend to produce anchylosis of the joint and hence in the ordinary sense, produces a cure. That remedy which produces anchylosis of the bones of the hock, the quickest is the best. As soon as the diseased joints are anchylosed the main joint of thev hock remaining free, the horse is said to be cured.

Ring Bone.

Ring-bone is a bony tumor usually situated on the pastern bore and after pasing clear around the bone. It is termed high when affecting the pastern joint and low when affecting the coffin joint. This is but another form of exostasis and may or may not cause lameness. It occurs more often on the hind limb than on the fore; and is oftenest seen in horses with upright pasterns and coarse bones, it seldom occurs in high bred animals. In general the causes, for this are the same astgose for spavin,--injury, strain, and concusion. A young horse put to severe work, violent racing and whirling or an injury to the part; picking up a nail or being caulked. The horse with upright pasterns receives all the concusion on the ends of the pasterns which excites inflamation, while the oblique pastern springs and avoids the concusions. We may consider this disease hereditary, for the offspring of animals having ringbones are prone to have them also and strains are sometimes predisposed to them.

Often in the beginning there is lameness without apparent cause, and later a ring-bone will form. This lameness is peculiar in that if it is in the front leg, the animal brings the heel down first and if in the hind leg, the toe is brought down first. The lameness improves with progression but is worse after a hard day's work. In the early stage there will be fever in the part, spring seems to be the time when it is likely to come on. By wetting the legs and comparing them, any tumor will show.

The treatment of this disease is similar to that for splint and spavin, the object being to produce anchylosis as soon as

posible. In advanced stages, the disease is incurable. In the early stage, give rest and apply a soothing remedy; fomentations as hot as animal will bear it for twenty minutes three times a day for eight days. After resting a while repeat. In later stages apply counter-irritants as for spavin. In all cases firing must be resorted to.

When all other remedies have failed, there is yet left one resort. We perform neurotomy., which consists in cutting the nerve above the part affected andthus removing all feeling and hence all lameness. This is accomplished by throwing the horse, holding his leg out straight, and cutting a slit one inch long above the fetlock and in front of the tendon. The cellular tisue is then dissected out and the nerve separated from the nerve and artery, which are all in one sheath, by a narrow tape; then placing a knife under the nerve, cut as near the upper end of the slit as posible and then at thebottom. The injection of cocaine above the point of operation will greatly lessen the pain. The horse must then be rolled over and the other side of the leg operated upon. The results of this operation are often very gratifying, not only in ring-bone but in navicular arthritis. After this operation, the horse must be kept shod and the foot closely watched; as the horse has no f feeling and might pick up a stone or a nail and show no signs of it until it had caused serious trouble. A horse thusx operated upon strikes his foot much harder than before and would pound it to pieces were it not for his shoes. An untoward result sometimes follows, the tissues undergoing fatty degeneration.

Navicular Arthritis.

This disease is lameness of the navicular joint, supposed by some to be due to inflamation of the navicular bone and by others to be due to an abnormal condition of the flexor pedis perforans. Probably it may result from either. The disease affects the under side of the bone, or the upper surface of the perforans tendon. At first there is inflamation which is

followed by ulceration of the cartilage and finally by adhesion of the tendon and bone. There is often quite extensive caries, sometimes enough to fracture the bone.

Perhaps this disease is hereditary to a greater degree than any of the others which we have mentioned. A horse with a contracted hoof is not, as might be supposed, particularly subject to the disease, though contraction is likely to follow as a result, but the horse with a prominent frog and hard, unyielding hoofs is much more subject to an attack. This is easily understood when we consider that the exciting cause is usually frog pressure from hard work or stony roads.

In this disease the lameness comes and goes. The horse is lame without apparent cause. The lameness seems to wear off when the animal gets warmed up, but is worse the next day. When standing the animal points the lame foot. The horse in trying to save his frog brings his weight on his toes and therefore wears the toe off his shoe. After the disease has made some progress, the structure of the foot becomes atrofied and contraction ensues. The affected foot appears smaller which is the opposite of ring-bone. When both feet are affected the horse digs his toes into the ground and is said to be "groggy".

This is a disease which the veterinarian dreads to handle. In the early stage, or when only the tendon is affected, it may be cured, but when the bone becomes diseased, it is practically incurable.

When lameness first appears, Percival recommends, having shoes removed, hoofs pared thin and the walls rasped down thin, foot bathed in warm water every day and poulticed, and at the end of a week, the shoe is tacked on again. With this he also gives a purgative. Much good may be done by standing the animal in a running stream of water every day for sevral hours at a time, or by making a clay puddle of blue clay, salt and water, and standing the animal in it. A favorite practice of some is to draw from six to eight pints of blood form the foot and apply to the coronet or pastern, a mild blister of cantharades.

A more severe blistering is s metimes performed by clipping the hair from the fetlock down and applying a strong blister. Some p:ss a frog seton but this is not much used. Whatever method is t be pursued, it is to be remembered that rest must be given.

When all else has fa led, ve have yet left a process that often works much good. I refer to t.e operation of neurotomy which was described under ring-bone.

Rheumatism and diseases of joints might properly be considered in this connection, however, they are not strictly bone diseases and we will omit them from our list.

Having considered these diseases, what conclusions may we draw? First we noticed that the diseases are to a great degree hereditary, therefore the use of mares if infected with this disease for breeding purposes, and the use of such stallions should never be permitted. Discreet breeding would to a great degree eliminate the unsoundness of horses. We may conclude that exostasis s an effort of nature to cur the disease or to strengthen the part. In treating these diseases we should try to hasten the processes ofnature rather than ntagonize them We must in all cases give rest. Counter-irritation is the line of treatment to which we resort in treating these diseases. In incurable cases of ring-bone and navicular disease, neurotomy not only restores the animal to a period of usefulness, but but relieves it of much pain and hence is to be recommended.