TCVM FOR THE TREATMENT OF EPM

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Abstract

Equine protozoal myeloencephalitis (EPM) is an important neurologic disease of horses most commonly caused by infection of the central nervous system by the protozoa, *Sarcocystis neurona*. Clinical signs can be focal or multifocal and are attributed to damage to neural tissues by invasion of the protozoa and concurrent inflammation. Many horses will test seropositive, however, only a small percentage will exhibit clinical signs which implies horses with a compromised immune system are susceptible to infection while horses with a healthy immune system are able to clear the parasitic infection without treatment. Traditional Chinese Veterinary Medicine theory views this disease pattern as a *Zheng Qi* Deficiency with *Qi* and Blood Stagnation. Premortem diagnosis in both Eastern and Western Veterinary Medicine involves a thorough neurologic exam and response to treatment. Treatment with acupuncture and herbal therapy alone or in conjunction with pharmaceuticals has a favorable prognosis. Food therapy and rehabilitation can assist the horse to return to full function. Recrudescence and reinfection when the immune system is challenged is a common sequela, therefore, long term care of EPM horses should include TCVM treatment during times when the *Zheng Qi* may be challenged.

Introduction and Background

Equine protozoal myeloencephalitis (EPM) is a neurologic disease of horses unique to North and South America first described in the 1970s. It is most commonly caused by infection with the protozoa, *Sarcocystis neurona* but infections with *Neospora hughesi* and *Sarcocystis fayeri* have been reported. Unlike *S.neurona, S. fayeri* forms muscle cysts which can release endotoxins that elicit a dysfunctional inflammatory immune response indistinguishable from *S.neurona* infection. Equine Muscular Sarcocystis (EMS) caused by *S.fayeri* has been reported in horses world wide and is not unique to the Americas.[1]

The definitive host for S. *neurona* is the opossum, *Didelphis virginiana,* a marsupial who's range extends from the Eastern US to the rockies and into Central America. Though not native to the West coast, the opossum was introduced in the 1930s and its range is slowly extending northward into Canada. EPM has been reported in all parts of the United States with a similar prevalence.

The horse is an intermediate dead end host and can be infected by ingesting sporocysts in food or water contaminated with opossum feces. Horizontal transmission is not possible and horses can not transmit *S.neurona* infection to other horses or other intermediate hosts.

Sporocysts hatch and release sporozoites into the lumen of the intestinal tract. The sporozoites penetrate the epithelium and enter the muscle tissue where they undergo asexual reproduction to become merozoites which then enter the bloodstream and eventually cross the blood-brain barrier to infect neural cells in both the white and grey matter in the central nervous system (CNS).[2]

The mechanism to cross the blood-brain barrier is unknown but is thought to involve merozoite infection of encephalitogenic T cells. Encephalitogenic T cells are leukocytes with the ability to cross the blood-brain barrier. Molecular imaging techniques have shown encephalitogenic T cells adhere to the epithelium of the CNS microvasculature and migrate along the luminal surface until they are able to find an entry point.[3]

Many horses will test positive for the protozoa but few progress to neurologic disease. Reported seroprevalence varies widely from 15% to as high as 89% however horses with active disease is far lower. The factors contributing to the progression are unclear. Stress, vaccination and other concurrent disease have been implicated. Animal models of Experimental Allergic Encephalitis (EAE) which are used to help understand human neurologic diseases with an autoimmune component such as Multiple Sclerosis have shown that the gut microbiome has some influence on the ability of encephalitogenic T cells to cross into the CNS.[4]

Retrospective studies found some predisposing factors for horses at a higher risk of developing EPM which included age, season, presence of opossums and a stressful lifestyle. Young horses between the age of 1 to 5 years and horses

older than 13 years had a higher prevalence. Horses were three times as likely to be diagnosed with EPM in the Spring and Summer and six times as likely to be diagnosed with EPM in the Fall as compared to Winter. A large opossum population in the area correlated with a higher prevalence of disease. Racing and Competition horses had a higher risk of developing disease as compared to pleasure and breeding horses.[2]

Clinical Signs

EPM commonly presents as a progressive neurologic disease with an insidious onset of focal or multifocal signs depending on what part of the spinal cord, brainstem and/or brain is involved.

Some cases have presented with acute signs with severe ataxia, seizures and recumbency while others have mild signs over a long period of time with intermittent episodes of relapse and recovery.

Most cases involve a bright, alert horse with a gait abnormality and asymmetric ataxia with muscle wasting, however, signs can be variable depending on location. Involvement of the cerebrum may cause depression, behavior changes or seizures. Lesions in the brainstem may cause cranial nerve deficits and involvement of the cerebellum may cause muscle spasticity and a "Shivers - like" presentation. In the spinal cord, signs of gray matter involvement include muscle weakness followed by muscle atrophy because the neuronal cell bodies are damaged. The quadricep, gluteal and temporalis muscles are often affected. White matter involvement results in ataxia and weakness or hypertonia in limbs caudal to the site of infection because the communication between neurons is damaged.[5] Experimentally induced horses show loss of appetite, decreased tongue tone and facial paralysis Early signs of EPM such as stumbling and frequent interference between limbs can be confused with lameness.[6]

Conventional Diagnosis

Definitive diagnosis requires post mortem conformation of parasites in the CNS, however in up to 50% of cases, diagnosis was made presumptively on the characteristic inflammatory pattern without detection of parasites.[2]

In practice, if after a thorough neurologic examination, EPM is high on the differential diagnosis list, there are testing options available. Western Blot (WB), indirect fluorescent antibody tests (IFAT) and enzyme-linked immunosorbent assay (ELISA) assays for the parasite surface antigens SAG 1, 5 and 6 on blood and/or spinal fluid can be used independently or read as a ratio of CSF titers to Serum titers. A positive response to treatment is also used for a presumptive diagnosis with or without laboratory testing.[2]

Conventional Treatment

Historically it was believed that infection of the parasite caused focal mechanical damage to the neural tissues, but current research shows that parasite induced inflammation of the nerves causes the majority of clinical signs, therefore, current treatment therapies focus on two goals, to eliminate the parasite and to reduce inflammation.[6]

Oroquin-10 (FP), decoquinate at 0.5 mg/kg combined with levamasole at 1 mg/kg for 10 days showed improvement of clinical signs in 93.6 % of horses. Decoquinate is highly efficient at eliminating the protozoa, while levamasole is an immune modulator that reduces inflammation and helps to restore immune balance.[7]

Three other common commercially available treatments address the elimination of the parasite :

Marquis (BAH), ponazuril at 5 mg/kg per day for 28 days has shown decrease in clinical signs and does cross the BBB to reach the CNS.[8] Some protocols recommend a loading dose of 15 mg/kg day to achieve steady state concentrations in the CNS within 28 hours. Efficacy of this treatment, defined as improvement of clinical signs by one grade, is 60% with 8% of those cases relapsing within 90 days.[8]

Protazil (MAH), diclazuri**l** at 1 mg/kg per day for 28 days also improved clinical signs by one grade in 58% of horses.[9]

Rebalance (PRN) sulfadiazine at 20 mg/kg and 1 mg/kg pyrimethamine per day for 90 days improved clinical signs in 61.5 % of treatment horses. Because sulfadiazine and pyrimethamine are folate inhibitors, side effects such as bone marrow suppression have been documented.[10]

Conventional treatments are usually prescribed with concurrent NSAID or steroid therapy to address inflammation along with 5000 - 7000 IU Vitamin E as an antioxidant.[11]

TCVM Etiology

Why is there such a high prevalence of seropositive horses but a low percentage of horses who exhibit clinical signs of myeloencephalitis ?

In TCVM, we see this as a *Zheng Qi* Deficiency with *Qi* and Blood Stagnation. The *Zheng Qi* is sometimes called Antipathogenic or Resistence *Qi* because it represents the body's ability to resist disease. Where there is not free flow of *Qi* and Blood, there is Stagnation which manifests in the body as pain and weakness.

Zheng Qi is the body's immune system and is made of *Wei Qi*, the external, extravascular defensive *Qi* and the *Ying Qi*, the internal, intravascular *Qi*. The *Wei Qi* protects and moistens the skin and muscles, opens the pores and regulates the body temperature. The *Ying Qi* is associated with Blood, serum and proteins and nourishes the whole body while it circulates in the vessels and channels.[12]

In the case of EPM, the *Zheng Qi* is not strong enough to resist the parasitic infection in the CNS and the concurrent damaging inflammation. The inflammation causes *Qi* and Blood Stagnation which is expressed as weakness, ataxia muscle atrophy, pain and/or behavior change.

Factors that contribute to a weak *Zheng Qi* include factors that cause immunosuppression; stress, poor nutrition, over work, steroids and other immunosuppressive drugs. Competition horses have a higher risk of developing clinical signs of EPM than pleasure and breeding horses. Age can also be a factor. In a retrospective study using postmortem data from 10 diagnostic centers in North America, 61 % of EPM cases were in horses 4 years old or less.[2] Perhaps in horses less than 4 yrs old, the adaptive immune system has not completely matured. Concurrent chronic disease such as Lyme, Anaplasmosis and vaccinations can over tax the *Zheng Qi* and cause relapse with horses in remission or re-exposed to new parasites.

Diagnosis of EPM seems to have a seasonal predilection with 3 times as many cases seen in the Spring and Summer and the risk being 6 times higher in the Fall.[2]

The pathogen associated with Spring is Wind. The Wind pathogen can enter the body and bring with it other pathogens, in this case, Sarcocystis. Wind is also wandering and if the *Zheng Qi* is not strong enough, Wind can spread the pathogen throughout the body.

Summer is the season of Heat. Too much Heat can cause Dryness and weaken the *Wei Qi's* ability to protect and moisten the skin and cause too much sweating. Too much Heat can also rise up and cause Shen Disturbance leading to increased levels of endogenous cortisol which decreases the *Zheng Qi*.

Fall is the season of Dryness. Dryness damages the Lungs and the *Zheng Qi.* In competition horses, Fall is also the end of the competition season. Horses have been working hard all Spring and Summer and are gearing up for year end championships. They may travel long distances and be stabled at large show/race barns with horses from all over the country and may be exposed to viruses such as Equine Herpes and Influenza. Many have also had conventional therapy for musculoskeletal and performance issues, like intra-articular steroid injections and over the counter performance supplements. They may be battling gastric and hindgut ulcers from a full season of showing causing a Liver and Spleen Disharmony. Animal models have shown that an imbalanced gut biome increases the ability of encephalitogenic T cells to cross the BBB which may be the mechanism by which the Sarcocystis enters the CNS.[4]

TCVM Diagnosis

As stated above, the clinical signs of neurologic disease will be present and may be variable depending on the part of the CNS that is affected. Chronic cases may show asymmetrical muscle atrophy. The tongue may be pale or pale purple and the pulse will be weak. Sensitive points on the diagnostic acupuncture point palpation examination (DAPPE) include GB-32, KID-27, BL-53, *Bai-cong-wo* and *Feng-long.*

Cases with moderate to severe *Qi* and Blood Stagnation may present with an Immune-Mediated Myofascial Syndrome pattern with extreme sensitivity in the whole body and will not want to be touched.[13] They may present as girthy, resistant to grooming and may begin to show aggression towards people and other horses. An accurate DAPPE is not possible in these horses as all points are painful. Hemo-acupuncture at BL-67, GB 44 and LI-1 may help reduce sensitivity and allow for a more accurate DAPPE.

Acupuncture Treatment

Treatment principles include :

- Tonifying *Zheng Qi*
- Tonifying Spleen *Qi*
- Clearing Stagnation of *Qi* and Blood.

Treatment protocol and duration will be determined by severity of clinical signs and response to treatment. Prognosis for recovery is favorable with TCVM treatment and rehabilitation alone or in conjunction with conventional treatments.

Predisposing factors that weaken the *Zheng Qi* can lead to recrudescence or reinfection of *S.neurona*. Recrudescence, termed post-treatment EPM disease syndrome (PTEDS) is attributed to an autoimmune polyneuritis and/or a dysfunctional inflammatory immune response caused by *S. fayeri* endotoxin.[14] Long term care of EPM horses should include TCVM treatment during times when the *Zheng Qi* may be challenged. Acupuncture and herbal therapy two weeks before and after vaccinations has shown to be beneficial in these horses as is routine TCVM therapy in the Spring and Fall.

Table 1 shows the recommended acupoints and the action for each acupoint used for treatment.

The combination of points, LI-4, LI-10, LI-16, ST-36, LIV-3, GV-14 and *Bai-hui* stimulated with electroacupuncture (EA) has shown to increase stem cell release from the bone marrow.[15] In addition, these acupoints are some of the most commonly used acupoints for Tonifying *Qi*, Clearing Stagnation and Clearing Heat associated with infectious disease.

Aqua-acupuncture (Aqua-AP) with 5 cc of the horse's own blood at KID-27, LI-11 and GB-32 can Tonify the *Zheng Qi*.[16]

EA of ST-36 connected to GB-34 is a powerful combination for *Qi* and Blood Stagnation.

Choosing acupoints that influence the Extraordinary Meridians can help reduce ataxia and weakness. *Yang Qiao Mai* (*Yang* Heel Vessel) is paired with the Governing Vessel (*Du Mai*). Acupoints on these Meridians help with structure of the body, balance, proprioception and inflammation of the spine and CNS. The master point for the *Yang Qiao Mai* is BL-62 which is also the coupling point for the Governing Vessel, the end point is GB-20 and an intersection point is LI-16.

Table 1: Recommended Acupoints for the Treatment of EPM

Point	Action
LI-4	Stimulates the immune system. *Yuan*-source acupoint
LI-10	Simulates the immune system and Tonifies *Qi* (Front 3 mile point)
LI-16	Simulates the immune system. Crossing acupoint of the *Yang Qiao Mai* for ataxia, External Wind and local neck pain.
GV-14	Simulates the immune system
ST-36	Simulates the immune system and Tonifies *Qi* (Rear 3 mile point)
LIV-3	Simulates the immune system and Clears Stagnation

GB-34	*He-sea* acupoint belonging to Earth, Tonifies Spleen *Qi*. Influential acupoint for tendons and ligaments. Clears Stagnation.
Qi-hai-shu	Classical equine acupoint to Tonify *Qi*
SP-6	Crossing acupoint for all *Yin* Channels of the pelvic limb and Tonifies *Yin* and Spleen
BL 20	Back-*shu* association acupoint for the Spleen
KID-27	*Shu-fu* means the house of all *shu* points so this acupoint Tonifies *Fu* Organs. Aqua-AP with 5 cc of horse's own blood can Tonify *Zheng Qi* and stimulate stem cell release from the bone marrow.
LI-11	*He-sea* acupoint belonging to Earth, Tonifies Spleen *Qi*. Aqua-AP with 5 cc of horse's own blood can Tonify *Zheng Qi* and stimulate stem cell release from the bone marrow.
GB-32	Acupoint for hindlimb paralysis by Tonifying Gallbladder and the cerebellum. Aqua-AP with 5 cc of horse's own blood can Tonify *Zheng Qi* and stimulate stem cell release from the bone marrow.
BL-62	Confluent acupoint for the *Yang Qiao Mai* for ataxia and influences the spinal cord and brain.
TH-5	Confluent acupoint for *Yang Wei Mai.* Paralysis of the forelimb
Yan-chi	Confluent acupoint for the *Dai Mai,* Performance acupoint for the horse
GB-39	Influential acupoint for Marrow
GB-20	End of the *Yang Qiao Mai*, local acupoint for brain and brainstem
Da-feng-men	Expels Wind, local acupoint for brain
BL-54	Master acupoint for the pelvic limb
Shen-shu+*Shen-shu*	Tonifies the Kidney

The *Yang Wei Mai* (*Yang* Linking Vessel) influences the *Zheng Qi* and the sides of the body. The Yang Wei Mai is paired with the *Dai Mai* (Girdle Vessel) which gives the body strength. The master point for the *Yang Wei Mai* is TH-5 and is used for paralysis of the forelimbs and to Tonify the *Zheng Qi*. The master point for the *Dai Mai* in the horse is the classical point, *Yan-qi* while in other species, GB-41 is recognized as the master point. The *Dai Mai* links the front and rear halves of the body, moves *Qi* and Blood in the legs and improves the body's structural strength like a belt or girdle. Imagine 24 chopsticks. With a belt around the group, they are able to stand up on their end perpendicular to the table. Without the belt, the chopsticks will separate and fall to be parallel to the table.[17]

Herbal Medicine

Qing Hao San (JT) is the herbal formula to treat EPM.[18] Its main actions are to kill parasites and Tonify *Qi*. Its king herb is *Qing Hao* (Artemisia) with strong antiparasitic effects against protozoa. The ministers are from 2 common formulas, *Guan Zhong San* (Dryopteris Root Powder)(JT) for tapeworm and coccidial infections and *Si Jun Zi Tang* (Four Gentleman)(JT) used to Tonify *Qi*. Ingredients and TCVM actions can be found in Table 2.

Artemisinin, an extract of Artemisia was discovered by Tu Youyou in 1979. She referenced Shen Nong Ben Cao Jing (Shen Nong's Book of Medical Herbs), an ancient text that was the first Herbal Materia Medica developed in the time of the Yellow Emperor and compiled into a bamboo scroll during the Han Dynasty in 200 BCE, to identify herbs that might be used in a modern Malaria treatment. Extraction of Artemisia compounds using modern pharmaceutical production procedures proved ineffective. Dr. Tu referenced a text written in 300 AD by Dr. Ge Hong who detailed the decoction process in cold water rather than hot. Dr. Tu realized using heat during processing

destroyed the active compounds. She developed a cold extraction process and successfully developed a Malaria treatment based on Artemisia. In 2015, she was the first Chinese woman to be awarded the Nobel Prize and was the first Chinese citizen to win in the category of Science and Medicine.

Qing Hao's energy is Cold, bitter and pungent. It enters the Kidney, Liver and Gallbladder Meridians and its actions Clear Heat and Cool the Blood. The bitter and pungent taste is due to the high concentration of phenolic compounds such as tannins, flavonoids, coumarins and resveratrol which are responsible for *Qing Hao's* high oxygen radical absorbance capacity which measures the strength of antioxidant activity.[19] Much research has been done on the mechanism of action of the extracted compound Artemisinin which cleaves an endoperoxide bridge in vivo and releases oxygen free radicals that kill parasites by depolarizing both its mitochondrial and plasma membranes and damages lipids and amino acids.[20] The strong antioxidant activity present in the whole plant extract may produce a protective effect and reduce toxicity to the host as compared to the extract alone.

Bing Lang (Areca-betel nut) is Warm, pungent and bitter and enters the Stomach and Large Intestine Channels. *Bing Lang's* main alkaloid is arecoline which has parasympathetic and muscarinic actions similar to common synthetic antiparasitic drugs used in veterinary medicine today like GABA agonists (Piperizine) and nicotinic agonists(Levamasole, Pyrantel). It is chewed in many parts of the world like chewing tobacco.

Guan Zhong (Dryopteris-wood fern root) is Cold and bitter and enters the Stomach, Spleen and Liver Channels. *Guan Zhong* contains flavaspidic and filicic acid which paralyzes the muscles of intestinal parasites so they can be expelled from the intestines.[21]

Shi Jun Zi (Quisqualia-chinese honeysuckle seed) is Warm and sweet and enters the Spleen and Stomach Channels. *Shi Jun Zi* contains quisqualic acid which causes rigid paralysis in parasites by binding to glutamate receptors on their nerves.

Lei Wan (Omphalia Fungus) is Cold and bitter and enters the Stomach and Large Intestine Channels. *Lei Wan* contains Omphalia α- proteinase which digests and breaks down the outer proteins of parasites.

Dang Shen (Condonopsis root), *Bai Zhu* (Atractylodes root) and *Huang Qi* (Astragalus root) are *Qi* Tonics. *Dang Shen* is Neutral in temperature while *Bai Zhu* and *Huang Qi* are Warm. All three are sweet and enter Spleen to help increase the production of *Gu Qi* from food and assist the Lung to distribute *Qi* throughout the body. They contain carbohydrates, amino acids, saponins, glycosides, flavonoids and essential oils to nourish the body, regulate blood sugar levels, metabolism and hormone balance.[21]

Gan Cao (Licorice root) is Neutral and sweet. It enters all 12 Channels to harmonize the other herbs in the formula and Tonifies the Spleen *Qi*. *Gan Cao's* main saponin is glycyrrhizin which modulates enzymes involved in inflammation and oxidative stress so it can down regulate pro-inflammatory mediators.[21]

Table 2: Ingredients and Actions of *Qing Hao San*

%	English Name	Chinese ***Pin-Yin***	**Actions**
13	Artemisia	*Qing Hao*	Kills and Expels Blood-mediated parasites
12	Areca	*Bing Lang*	Expels gastrointestinal parasites
12	Dryopteris	*Guan Zhong*	Kills parasites
12	Quisqualia	*Shi Jun Zi*	Kills gastrointestinal parasites
12	Omphalia	*Lei Wan*	Kills internal and external parasites
11	Condonopsis	*Dang Shen*	Tonifies *Qi and Blood* and Strengthens *Zheng Qi*

11	Atractylodes	*Bai Zhu*	Tonifies *Qi* and Strengthens the Spleen
12	Astragalus	*Huang Qi*	Tonifies *Qi* and enhances immune function
5	Glycyrrhiza	*Gan Cao*	Harmonizes the formula, increases palatability

Food Therapy

Foods to Tonify *Qi* and Drain Dampness can be helpful for complete recovery and reduce the risk of relapse and/or reinfection by keeping the Spleen and *Zheng Qi* strong.

Table 3 shows whole food ingredients that can be used as Food Therapy for Horses with EPM.

Table 3: Whole Foods and Their Actions for Horses with EPM

Food	**Pinyin**	**Temperature Taste**	**TCVM Actions**	**Nutrition Note**
Black Oil Sunflower Seeds	*Hei kui hua zi*	Warm sweet, salty	Tonifies Spleen and Kidney *Qi* Transforms *Phlegm*	High in Vitamin E
Chia Seeds	*Qi ji ya zi*	Cool salty	Tonifies Kidney *Qi*	High in antioxidants and Omega 3s
Sweet Potato Yam	*Gan shu* *Shan yao*	Warm sweet	Tonifies Spleen *Qi*	High in Vit E Regulates blood sugar
Oats	*Yan mai*	Warm sweet	*Qi* Tonic	
Goji Berry	*Gou qi zi*	Neutral sweet	Tonify Spleen and *Zheng Qi*	Polysaccharides similar profile to medicinal mushrooms

Radish	*Bai luo bo*	Neutral pungent	Resolves Stagnation Promotes *Qi* Flow	High in Vit C & antioxidants
Ginger	*Sheng jiang*	Warm pungent	Resolves Stagnation Promotes *Qi* Flow	Antioxidant
Kelp Kombu	*Kun bu*	Cold salty	Transforms *Phlegm* Tonifies Kidney *Qi* and regulates water metabolism	High in Iodine to support the thyroid and immune system
Apple Cider Vinegar	*Ping guo zhi cu*	Warm sour, bitter	Resolves Stagnation Drys Dampness	Mild activity against parasites
Ripe Tangerine Peel	*Chen pi*	Warm pungent, bitter	Regulates Qi Strengthens the Spleen Drys Dampness Transforms Phlegm	Anti inflammatory anti ulcer Rebalance Gut microbiome

Food Therapy in horses starts with establishing a solid foundation of good quality pasture and hay. Horses should consume 2.5% of their body weight per day in forage so the average 1000 lbs horse should eat 25 lbs of hay/pasture daily. Horses recovering from EPM may need additional protein and calories to help rebuild muscle mass and may benefit from foods containing Vitamin E.

Grazing on good grass pasture usually accounts for 1000 to 2000 IU per day, however, 5000 IU of Vitamin E per day is recommended for horses with neurologic disease.[11] Supplementation in addition to food therapy may be necessary to reach therapeutic Vitamin E levels. Many vitamin E supplements are synthetic (dl-α-tocopheryl acetate). Naturally occuring Vitamin E in foods is d-α- tocopherol and is 5-6 times more bioavailable than the synthetic form. Elevate (KPP) and Nano E (KER) are two good options for supplementation of d-α- tocopherol.

***Tui-na* Therapy**

Tui-na therapy can be done by owners between acupuncture treatments and throughout the rehabilitation period which, depending on the severity of clinical signs, can extend over a period of months. Treatment principles include relieving Stagnation (reducing pain and hyperalgesia), Tonifying the *Zheng Qi* (strengthening the immune system) and restoring balance and proprioception.[22]

- Light Massaging (*Moo-fa*) over the back and rear limbs
- Single-thumb (*Yi-shi-chan*) BL-18 to BL-23 and at LI-10, LI-16, ST-36 and LIV-3
- Rubbing (*Ca-fa*) over the hocks, carpus, fetlocks to stimulate BL-62, KID-3, SI -3 and TH-5
- Tail Pulls (*Ba-shen-fa*) Gentle traction to spine stimulates *Hua-tuo-jia-ji* and *Ba-jiao* to relieve Stagnation in the spine.
- Tail pulls (*Ba-shen-fa*) to each side engage the muscles of the hind limbs and helps restore strength and balance.
- Rocking (*Yao-fa*) Gentle Range of motion movements in the joints of front and rear limbs relieve Stagnation and help regain proprioception.

Rehabilitation

Rehabilitation is crucial for full recovery and should involve frequent reassessments by the treating veterinarian. Relapse of EPM clinical signs and/or reinfection is not uncommon and early diagnosis and treatment is important.[23] Ataxic horses put into work are more susceptible to muscle and tendon injuries because they lack balance and the protective mechanisms of stretch receptors in the muscles and joints may be compromised. Riders should also be made aware of the danger of riding a neurologic horse.

Goals of rehabilitation include :

- Relieving Stagnation (pain)
- Restoring *Qiao* (balance)
- Restoring *Jin gu* (muscle strength)
- Restoring the *Shen* (horse confidence)
- Restoring sensory processing and neuromotor function

Proprioceptive exercises such as stepping over poles, turning and backing up in hand may begin when the horse has regained enough confidence and balance to trot in the pasture while turned out. Start on flat ground with solid footing on straight lines. Many riders start rehab on the lunge or in the round pen. This may be too difficult for a horse lacking balance and muscle strength as working on a 20 meter or smaller circle requires coordination of front and hind limbs, bending through the body and self carriage. As the horse becomes stronger and more confident, work on uneven ground and under saddle work can begin.

Conclusion

EPM represents a treatment challenge for veterinarians due to the variety of clinical presentations due to the location of the parasitic infection, the autoimmune component, lack of definitive diagnostic tests and the physical challenge of rehabilitating horses with CNS disease. Traditional Chinese Veterinary Medicine gives the practitioner additional tools for diagnosis and treatment. Treatment with acupuncture and herbal therapy alone or in conjunction with pharmaceuticals has a favorable prognosis. Food therapy and rehabilitation can assist the horse to return to full function. Recrudescence and reinfection when the immune system is challenged is common sequela, therefore, long term care of EPM horses should include TCVM treatment during times when the *Zheng Qi* may be challenged.

Abbreviations

Aqua-Ap	Aqua-acupuncture
BBB	Blood-brain barrier
CNS	Central nervous system
CSF	Cerebrospinal fluid
DAPPE	Diagnostic acupuncture point palpation examination
EA	Electro Acupuncture
EAE	Experimental allergic encephalitis
ELISA	Enzyme-linked immunosorbent assay
EPM	Equine Protozoal Myeloencephalitis
EMS	Equine muscular sarcocystis
GABA	Gamma-Aminobutyric Acid
IFAT	Indirect fluorescent antibody tests
NSAID	Non steroidal anti-inflammatory drugs
PTEDS	Post-treatment EPM disease syndrome
SAG	Surface Antigens
TCVM	Traditional Chinese Veterinary Medicine
WB	Western Blot

Footnotes

BAH	Bayer Animal Health, Shawnee Mission, Kansas
FP	Frank's Compounding Labs, Ocala, FL
JT	Dr. Xie's Jing Tang Herbal, Inc Reddick, FL
MAH	Merck Animal Health, Madison, NJ
KPP	Kentucky Performance Products, Lexington, KY
KER	Kentucky Equine Research, Lexington, KY

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