High resolution protein electrophoresis of equine cerebrospinal fluid

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Objective—To determine normal CSF electrophoresis patterns in horses, and to determine whether the electrophoretic scans from horses with cervical compression differ from those of neurologically normal horses.

Animals—32 horses assigned to 1 of 2 groups: neurologically normal (n = 18) or cervical compression (n = 14).

Procedure—CSF was collected from 18 neurologically normal horses referred to the Marion duPont Scott Equine Medical Center, and protein electrophoresis was performed to describe the normal equine CSF electrophoretogram. Results of CSF electrophoresis from 14 horses with cervical compression were then compared with results for the neurologically normal horses.

Results—Horses with cervical compression had decreased β-globulin fraction, and 1 or 2 prominent post-β_2 peak(s). When the presence of post-β peaks was used as a diagnostic criterion for cervical compression, the test had sensitivity of 71.4% and specificity of 81.8%. The positive and negative predictive values were 83.3 and 69.2%, respectively.

Conclusion and Clinical Implications—Electrophoresis of CSF may be a useful diagnostic aid in evaluation of horses with neurologic disease. (*Am J Vet Res* 1997;58:939–941)

Electrophoretic studies of CSF have been described in human beings[1] and dogs[2]; however, few studies regarding equine CSF electrophoresis have been published.[3,4] Kirk et al[3] reported electrophoresis of equine CSF, using cellulose acetate membranes. In that report, CSF from a horse with cervical compressive disease was analyzed and increased α- and β-globulin fractions were detected, suggesting that CSF electrophoresis may have value in the evaluation of horses with CNS disease. Kristensen et al[4] also reported the pattern of CSF electrophoresis, using agarose in 20 neurologically normal horses of various breeds. Relevant findings of that study, in addition to a description of normal values, included recognition of a prealbumin peak in all CSF samples. Clinical cases were not reported.

These methods of CSF electrophoresis have not been used clinically in neurologic evaluation of horses. Although the reasons for this cannot be specifically stated, the lack of definition and specificity of the various bands undoubtedly minimizes value of the test. Previous studies[3,4] have documented differences in the supporting matrix used for electrophoresis that have an effect on the results. This could add further confusion to interpretation of the test in a clinical setting. **High resolution electrophoresis (HRE)**, however, produces sharper bands, allowing more precise definition of protein components of the CSF,[5] and potentially enhancing the clinical usefulness of CSF electrophoresis.

The study reported here was performed to describe the normal CSF values derived from HRE in horses, and to describe the findings of HRE electrophoresis of CSF from equine clinical cases of cervical compression.

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Materials and Methods

Horses—A total of 32 horses were examined and were assigned to 1 of 2 categories: neurologically normal (18 horses), or having cervical compressive disease (14 horses). Horses were considered neurologically normal on the basis of normal results of physical and neurologic examinations, CSF analysis, and gross postmortem examination of the brain and spinal cord. The diagnosis of cervical compression was confirmed by myelography alone in 2 horses, compression revealed by myelography and evidence of grossly visible compression at necropsy in 4 horses, and myelography and histologic examination of the spinal cord in 8 horses.

Sample collection—For neurologically normal horses, CSF was collected from the **atlanto-occipital (A-O)** and **lumbosacral (L-S)** spaces, after pentobarbital administration (25 mg/kg of body weight, IV), and use of described methods.[6] Cerebrospinal fluid was not collected from the L-S space of 7 neurologically normal horses. After sample collection, the horses were euthanatized by lethal injection[a] and routine necropsy, including removal and physical examination of the brain and spinal cord, was completed. For horses with cervical compression, aliquots of CSF taken from the L-S space during routine clinical examination were analyzed.

Sample evaluation—After collection, the CSF sample was immediately assayed for total protein and glucose concentration, and RBC and total and differential nucleated cell counts. Analysis was performed, using routine clinical methods that have been validated for equine CSF samples.[7] Total protein concentration was assayed, using pyrogallol red with a human albumin standard.[b] Red blood cell and total nucleated cell counts were performed by use of a hemocytometer. Differential counts were performed on slides prepared from centrifuged CSF and stained with Wright's stain. After biochemical analysis, all samples were processed in a refrigerated centrifuge set at 600 × g for 10 minutes, and the supernatant was frozen at −70 C until electrophoresis was performed.

Electrophoresis procedure—After thawing at room temperature (20 to 22 C) samples were analyzed by HRE[c] (agarose gel in barbital buffer), using the manufacturer's sug-