Forebrain Diseases

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Anatomy

- Cerebrum
- Thalamus
- Hypothalamus
- Telencephalon
- Diencephalon
- Prosencephalon (Forebrain)
Functions of the forebrain

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Diseases with forebrain signs

- **Viral**
  - EEE, WEE, VEE
  - Rabies
- **Protozoal**
  - EPM
  - *Neospora hughesi*
- **Bacterial**
  - Abscess
  - Meningitis
  - Listeriosis
- **Toxic**
  - Leukoencephalomalacia
- **Hyperammonemia**
  - Liver
  - Idiopathic
  - HHH of Morgans
- **Mass**
  - Neoplasia
  - Cholesterol granuloma
  - Abscess
- **Vascular**
  - HIE
- **Trauma**
  - Juvenile epilepsy
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Dementia

Loss of learned behaviors

Abnormal body positions

20-mo TB filly

Eastern equine encephalitis (EEE)

3-wk TB filly

Viral encephalitis?

3-mo TB filly

Hyponatremia

2-yo TB filly

Fluphenazine reaction

3-wo Thoroughbred colt

Hyponatremia
Dementia contd.

13-yo Paso Fino stallion
Suspected encephalitis

4-do Quarter horse filly
Frontal/parietal trauma

8-yo Quarter horse gelding
Subacute encephalitis

Dementia contd.

13-yo Standardbred gelding
Leukoencephalomalacia

13-yo Quarter horse mare
Gastrointestinal hyperammonemia

Compulsive walking/circling

Head-pressing

Loss of affinity for dam

Playing in water

Courtesy: Dr. E. Green, Texas A&M
Dementia contd.

Yawning

Hyperresponsiveness

7-mo Quarter Horse colt
Portacaval shunt

22-yo mixed breed mare
Intestinal hypergranuloma

Self-mutilation

Morbid lesion

Psychological syndrome

3-yo Thoroughbred gelding
Rabies

12-yo Thoroughbred stallion
Self-inflicted laceration
Self-mutilation syndrome

Don’t do this

Do this!!

Dementia - Forebrain

- Loss of learned behaviors
- Abnormal body positions
- Teeth-grinding
- Playing in water
- Neonatal loss of affinity for dam

- Compulsive walking
- Circling
- Compulsive yawning
- Hyperresponsive
- Self-mutilation
Functions of the forebrain

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Function of the forebrain

Anatomy of Alertness

- Cerebrum
- Thalamus
- Hypothalamus
- Midbrain
- Reticular activating system
- Cerebellum
- Senses
- Medulla oblongata
- Head & body motion
But first.....sleep disorders!

25-yr Thoroughbred gelding
Paradoxical sleep
Acquired narcolepsy?

7-yr Morgan filly
Inherited narcolepsy

Anatomy of Alertness

Adult Paradoxic Sleep
• Sleep deprivation
• True acquired narcolepsy

Neurotransmitter Balance
+ Hypocretin
+ Norepinephrine/serotonin
-- Acetylcholine
Levels of obtundation

- Lethargy
- Stupor
- Semi-coma
- Coma
Functions of the forebrain

**Function**
- Behavior/learning
- Alertness
- Vision
- Touch perception
- Motor control

**Cardinal Sign**
- Dementia
- Obtundation
- Blindness
- Hypalgesia
- Seizures

Blindness

Assumptions
- Optic nerves OK
  - Test PLR
- Can blink
  - Test palpebral
- Normal cerebellar cortex

3-month-old Quarter Horse colt
Skull trauma
### Functions of the forebrain

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### Perception of touch/pain

**Assumptions**

- Normal trigeminal nerve transmission
- Do V-VII tests

3-mo Quarter Horse Colt

Skull trauma
Functions of the forebrain

- **Function**
  - Behavior/learning
  - Alertness
  - Vision
  - Touch perception
  - Motor control

- **Cardinal Sign**
  - Dementia
  - Obtundation
  - Blindness
  - Hypalgesia
  - Seizures

Seizures

- Abnormal synchronous electrical discharges in forebrain
- Spread to somatic and visceral motor areas
- Preictal, postictal
- Focal vs generalized
- Single, epilepsy, status epilepticus
Seizure - focal

- Pre-ictal
- Snorting
- Vocalizing
- Head-shaking
- Seizure - partial
- Left muzzle twitch
- Tongue movement
- Seizure - generalized
- Head turn to right
- Circling to right
- Post-ictal
- No menace L (90 min)
- Lethargic (5 min)

4-yo Palomino gelding

EPM?

Seizure - generalized

6-yo O.H mare

Epilepsy

- Extensor tonus

From: Delahunta A. Clin Tech Eq Pract 2006;5:74. With permission
### Acute management, adults

- 50 mg boluses diazepam, or
- 0.5 mg/kg xylazine, or
- Beuthanasia-D, 5-ml boluses
- General anesthesia

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### Maintenance management, adults

- Phenobarbital, 5 mg/kg/day orally
- 1 mg/kg/d increase every 2 wks until control
  - Plasma conc. 15-40 µg/ml
- ±KBr 25-90 mg/kg/day
- Taper over 3 months if seizure-free for 6 months
- Avoid ivermectin/moxidectin

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*IG Mayhew. Large Animal Neurology, ed 2, 2008.*
Functions of the forebrain

Behavior/learning
Alertness
Vision
Touch perception
Motor control**

Function Cardinal Sign

Obtundation
Dementia
Blindness
Hypalgesia
Seizures
Case 2

- 8-week-old Arabian filly
- Normal until this morning
- Stall, buckets in disarray
- Apparently blind
- Not suckling mare
- T 102.5 F
- Neurologic exam

Neurologic Exam

Clinical Sign
- Lethargic
- Defective vision
- No contact with dam
- No menace either side
- Touch perception present
- Seizures
Sudden loss of affinity for dam

<table>
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<tr>
<th>Clinical Sign</th>
<th>Lesion Location</th>
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<tr>
<td>Lethargic</td>
<td>Any brain</td>
</tr>
<tr>
<td>Defective vision</td>
<td>II, midbrain, forebrain</td>
</tr>
<tr>
<td>No contact with dam</td>
<td>Forebrain</td>
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<tr>
<td>No menace on either side</td>
<td>II, VII, cerebellum, midbrain bilateral forebrain</td>
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<td>Touch perception present</td>
<td>Competent V, brainstem forebrain function</td>
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Neuroanatomic localization

- Can the signs be explained by a single lesion?
- Yes, symmetric forebrain - mild?
Additional findings

- Ultrasound lung surface
  - Hypoechoic foci
- Radiograph lungs
  - Numerous focal densities
- Transtracheal wash
  - Intracellular gram-positive coccobacilli
- Rhodococcus equi pneumonia
  - Relationship to neurologic signs?

Clinical course

- Diagnoses
  - R. equi pneumonia
  - “Benign” juvenile epilepsy
  - Post-seizure encephalopathy
- Treatment
  - Clarithromycin & rifampin
  - Phenobarbital
    - 5 mg/kg BID PO for one month
    - 5 mg/kg SID PO for one month
The End
Menace - Palpebral reflex (V - VII)

Fractured stylohyoid
3-yo mixed breed gelding

Menace - Cerebellum

3-month-old Arabian colt
Cerebellar abiotrophy
**Without cataplexy**

- Need 0.5 h REM sleep daily
- Standing vs. recumbent REM
  - Standing stalls
  - Lameness
- Head drops, thoracic limbs buckle, horse recovers
  - Narcolepsy
  - Idiopathic hypersomnia
  - Sleep deprivation
- Difficult to distinguish

**Narcolepsy with cataplexy**

- Collapse with atonia/ areflexia
- Benign
- Familial/ persistent
  - Morgan
  - American Miniature Horse

- Role of hypothalamic nuclei
  - hypocretins
Narcolepsy-Cataplexy contd.

- Trial of phenylbutazone
- Physostigmine induction
- Treatment
  - environment
  - atropine
  - Imipramine
  - Yohimbine?
- Manage trauma

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Forebrain blindness

2-yo Thoroughbred filly
EEE