Presentation:

Classic case: Fast-growing calf or lamb, NEUROLOGIC, blind, staggering, down

Poorly understood nutritional disease of ruminants, associated w/ altered thiamine status and/or high sulfur intake

Bilaterally symmetric clinical signs of cerebral dysfunction: especially in calves, lambs, kids

<table>
<thead>
<tr>
<th>Acute:</th>
<th>Subacute:</th>
<th>With progression:</th>
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</thead>
<tbody>
<tr>
<td>Blindness</td>
<td>Depression/anorexia</td>
<td>Cortical blindness = ↓ menace + N pupil reflexes</td>
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<tr>
<td>Recumbency</td>
<td>Withdrawl from group</td>
<td>Dorsomedial strabismus</td>
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<tr>
<td>Rigidity, seizures</td>
<td>Facial, ear twitches</td>
<td>Head pressing</td>
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<tr>
<td>Coma</td>
<td>Head held elevated</td>
<td>Opisthotonus</td>
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<tr>
<td>Vocalization (goats)</td>
<td>Staggering, +/- hypermetria</td>
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Differential Dx: (Diseases of ruminant cerebral dysfunction)

**Cattle**
- Lead poisoning
- Vitamin A deficiency
- Hypomagnesemia
- H2O deprivation/ SaltTox
- Nervous ketosis
- Brain abscess
- Coccidiosis w/CNS involvement
- TEME: *H. somnus* meningoencephalitis
- Rabies/other meningitis, encephalitis
- Hepatoencephalopathy

**Sheep**
- Pregnancy toxemia
- Type D enterotoxemia
- Listeriosis
- Lead poisoning
- Salt Tox/H2O deprivation
- Nervous ketosis
Test(s) of choice:

Clinical signs; History - diet change, poor pasture, other dz causing anorexia

Dorsomedial strabismus pathognomonic (trochear nerve damage, cause unknown)
Rotten egg smell in rumen gases w/ high sulfur
Response to Rx w/ vitamin B1 is suggestive of PEM (but you still may not ID cause)

Laboratory tests:

- RBC transketolase - inconsistent, not always available
- Pyruvate, lactate, pyruvate kinase in blood
- Thiaminase in feces, rumen
- CSF - r/o encephalitis, ketosis - ketones-urine/milk/blood
- Lead (Pb) poisoning – Pb levels in blood/tissues

Necropsy lesions inconsistent, often subtle

Late pathology: Cavitation visible in cortex
Early cases: +/- Autofluorescent bands of necrotic cerebral cortex w/ UV light

Rx of Choice:

**EARLY TREATMENT IS VITAL** PEM Sx are seen before CNS damage occurs

1.) Thiamine (vitamin B1): 10-20 mg/kg TID dosing
   - INITIAL dose should be IV then IM, SC after
   - Continue vitamin B1 for **days past improvement**

2.) +/- Rx to decrease cerebral edema
   - Mannitol
   - Dexamethasone - 1-2 mg/kg IM or SC

3.) Rx primary disease(s)

4.) +/- Rx for seizures: Diazepam, Phenobarbital

5.) Support/prevent- Correct diet, transfaunate, force feed

Prevention:

Institute dietary changes slowly, ensure appropriate roughage/concentrate ratios, avoid bad pasture

Prognosis:

PEM is **reversible with early treatment** - Blindness is last sign to disappear;
Grave Px for advanced, prolonged cases, permanent brain damage possible
Pearls/Pathogenesis:
Thiamine deficiency, sulfur toxicosis, sodium toxicity, water deprivation, and lead toxicosis can ALL produce the clinical signs and lesions of PEM.

Aerobic energy metabolism disrupted in the brain → changes in membrane function, water and sodium accumulate inside the cell – cerebral edema, swelling, pressure necrosis.

Two causes of PEM:
1.) Thiamine deficiency - Vitamin B₁ is required for production of several enzymes (transketolase, etc.) needed for glucose metabolism and as a cofactor for ATP production in the brain

Normal thiamine production by rumen microbes barely meets dietary requirements

Anything that disrupts microflora thiamine production can lead to PEM:
- Animal off feed for any reason, adjusting to new diet, inappropriate diet
- High grain/low fiber diet favors growth of thiaminase producing bacteria
- Ingestion of thiaminase-containg plants - horsetail, pigweed, bracken fern, nardoo fern (Australia)
- Thiamine analogs given – amprolium, pyrimethamine, levamisole, thiabendazole

2.) Increased sulfur intake - H₂S gas in rumen (rotten egg smell!); Sulfur toxic to cellular metabolism
- Water with high sulfur content High molasses in diet (urea)
- Additives – gypsym (CaSO₄), Urinary acidifier AmmSO₄
- Alfalfa (Hi protein w/ S amino acids)
- Synthesis of S rich compounds - Cruciferous plants - Turnips, rape, mustard
- Acidifying agents w/ added S corn, sugar beet, cane sugar by-products
- Sulfate accumulators - kochia, lambsquarter, Canada Thistle


My Notes: