


NERVOUS SYSTEM (L-1)

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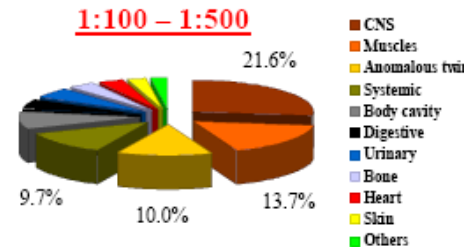


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DEVELOPMENTAL MALFORMATIONS OF NERVOUS SYSTEM

Estimated frequency of congenital disorders in cattle

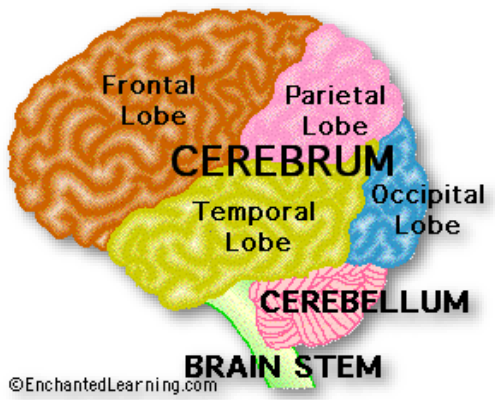
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System	Frequency (%)
CNS	21.6%
Muscles	13.7%
Anomalous twins	10.0%
Systemic	9.7%
Body cavity	
Digestive	
Urinary	
Bone	
Heart	
Skin	
Others	



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DEVELOPMENTAL MALFORMATIONS OF NERVOUS SYSTEM

- Many noxious agents — developing fetus in the uterus
- During the first trimester
 - Agenesis/Aplasia
 - Hypoplasia
 - Dysplasia
- Malformations of the CNS are rather common in domestic animals.
- May be
 - Inherited or
 - Acquired



Cerebellar Hypoplasia



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DEVELOPMENTAL MALFORMATIONS OF NERVOUS SYSTEM

ANENCEPHALY

- Total absence of the entire brain (**this probably does not occur**).

AMYELIA

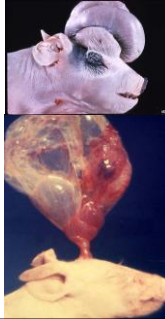
- Total absence of the spinal cord
- Usually occurs in association with anencephaly.

ENCEPHALOCELE

- Protrusion of the brain (along with the meninges) through a defect in the cranium.
- The skin forms the hernial sac.

MENINGOCELE

- Protrusion of the meninges through a defect in the cranium.



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DEVELOPMENTAL MALFORMATIONS OF NERVOUS SYSTEM

HYDRANENCEPHALY

- Complete or almost complete absence of the **cerebral hemispheres** in a normal cranium
- The **leptomeninges** form sac enclosing cerebrospinal fluid
- Hydranencephaly occurs in all species, but most common in **calves** in association with cerebellar hypoplasia
- The defect has been observed in **lambs of ewes vaccinated** during pregnancy for **bluetongue**.



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DEVELOPMENTAL MALFORMATIONS OF NERVOUS SYSTEM

SYRINGOMYELIA

- **Tubular** cavitation of the spinal cord.
- This is **rare** anomaly.

HYDROMYELIA OR SYRINGOHYDROMYELIA

- Simple dilatation of the central canal of the spinal cord
- The cavity is connected with the central canal and lined by **ependymal** cells.
- It causes progressive **ataxia** and **paresis**, **Scoliosis** and spinal pain.



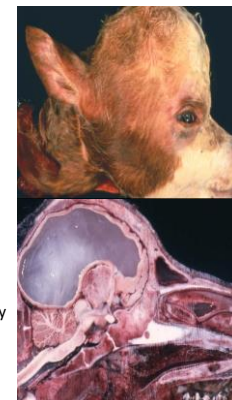
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DEVELOPMENTAL MALFORMATIONS OF NERVOUS SYSTEM

HYDROCEPHALUS

- Abnormal accumulation of **CSF in the cranial cavity**.
- congenital or acquired.
- In **internal** hydrocephalus, the fluid is within the **ventricular** system.
- In **external** hydrocephalus, the fluid is in the **sub-arachnoid** space.
- Congenital hydrocephalus most commonly observed in **pups, foals, calves** and **piglets**
- Acquired hydrocephalus is usually less severe than the congenital defect
- The causes are almost always **obstructive**.
- There is **parenchymal atrophy** affecting chiefly the white matter and the cerebral cortices

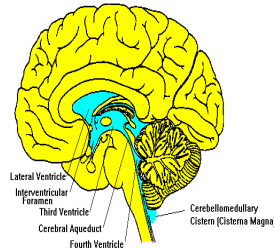


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Obstructive

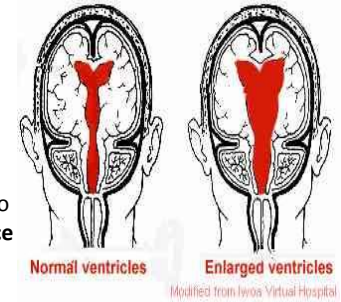
- This type of hydrocephalus results from an **obstruction within the ventricular system** of the brain that prevents CSF from flowing or “communicating” within the brain.
- The most common type is a narrowing of a channel in the brain that **connects two ventricles** together.



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Non-obstructive

- This type results from problems with the **production or absorption** of CSF
- The most common is caused by bleeding into the **subarachnoid space** in the brain



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DEVELOPMENTAL MALFORMATIONS OF NERVOUS SYSTEM

SPINA BIFIDA (split spine)

- caused by the incomplete closure of the embryonic neural tube.
- Dysfunction of the tail and anus, **incontinence**, and sometimes pelvic limb weakness
- The prognosis is poor.
- Spina bifida can also accompany the **sacrocaudal dysgenesis** that is inherited as an autosomal dominant trait in cats.



sacrocaudal dysgenesis



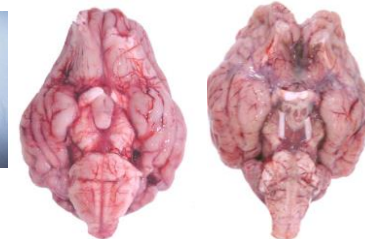
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INFLAMMATION OF THE NERVOUS SYSTEM

MENINGITIS (Head Pressing)

inflammation of the protective membranes covering the brain and spinal cord, (meninges).
inflammation of the brain (**encephalitis**)
often are seen simultaneously (**meningoencephalitis**) in the same animal
causes may include: viruses, bacteria or others including drugs.



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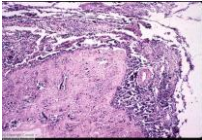

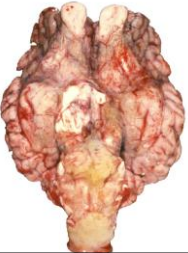
INFLAMMATION OF THE NERVOUS SYSTEM

ENCEPHALITIS
Inflammatory processes may involve the parenchyma of the brain


MYELITIS
Inflammation of the spinal cord

ENCEPHALOMYELITIS
Inflammation of both brain and spinal cord

ENCEPHALOMENINGITIS
Inflammation of brain and meninges


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INFLAMMATION OF THE NERVOUS SYSTEM

ABSCESES OF CNS

- May develop as a result of
 - embolism,
 - by direct implantation or
 - by direct invasion of the brain from an adjacent structure.
- In general, abscesses are more common in white matter than gray matter
- When abscesses are multiple, death is the outcome after a rather short course.



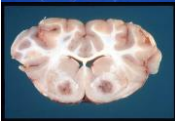


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ENCEPHALOMALACIA AND MYELOMALACIA

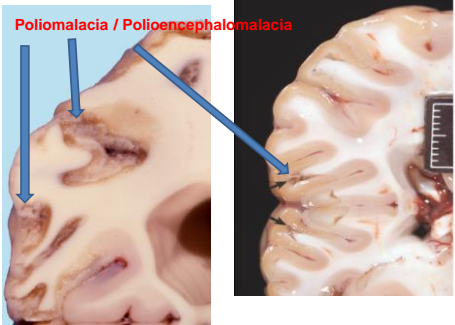
- **Malacia**
 - softening – necrosis of tissue in the CNS.
 - injuries to the CNS (encephalitis, trauma, anoxia, etc.).
- **POLIOMALACIA:** softening of the gray matter
- **LEUKOMALACIA:** Softening of the white matter.


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ENCEPHALOMALACIA AND MYELOMALACIA



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LISTERIOSIS (CIRCLING DISEASE)

- Sporadic bacterial disease caused by *Listeria monocytogenes*.
- It is most commonly manifested by:
 - Encephalitis or **meningoencephalitis** in adult ruminants,
 - **Septicemia** with **focal hepatic necrosis** in young ruminants and monogastric animals
 - **Abortion**.
- Recently been recognized as an important **public health problem**.
- Occur in adult sheep with right facial nerve paralysis; drooped right ear, right eye showing no reaction to the flash light and atony of right nostril.



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LISTERIOSIS (CIRCLING DISEASE)

- The course in sheep and goats is **rapid**, and **death may occur in 24-48 hr or 1-4 days**, in **cattle from 4-14 days**
- The **mortality** may approaches **100%**
- Signs are due to dysfunction of the **third to seventh cranial nerves**.
 - Initially, affected animals are anorectic, depressed, and disoriented.
 - May propels into **corners**, **leans against stationary objects**, or **circle toward the affected side**, **head pressing**.
 - **Facial paralysis with a drooping ear, deviated muzzle, flaccid lip**
 - Profuse **salivation**
 - animal **circles in one direction** only
 - Food often becomes impacted in the cheek
 - Animals fall and unable to rise at last stage
 - Fever, may be **105°F**,
 - **Abortion** — last trimester



Electronmicrograph of *L. monocytogenes*



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LISTERIOSIS (CIRCLING DISEASE)

- Bacteria invade **intestinal mucosa**.
 - **D-galactose residues**
- After epithelial cell entry
 - phagocytosis by MØ, PMN (**internalin protein**)
 - escapes phagosome, multiplies in cytoplasm
 - exocytosis from epithelial cell
 - **Listeriolysin, cytolyisin, hemolysin**
 - multiplication followed by death of phagocytes, secondary phagocytosis
 - systemic spread



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LISTERIOSIS (CIRCLING DISEASE)

- Organism multiplies **intracellularly**, it is largely protected against circulating immune factors such as antibodies and complement
- The effective host response is cell-mediated immunity (**CMI**)
- By means of **CMI**, **the bacteria spread systemically**
- *Listeria* are able to penetrate the **endothelial layer of the placenta** and thereby infect the fetus
- A peculiar property of *L. monocytogenes* that affects its food-borne transmission is the ability to **multiply at low temperatures**



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LISTERIOSIS (CIRCLING DISEASE)

Gross lesions

- Usually not observed in the brain; however, occasionally grayish foci of malacia may be found in cross-sections of the medulla.
- Lesions are most severe in the medulla and pons.
- Congestion of meningeal vessels and cloudiness of CSF
- Visceral lesions occur as multiple foci of necrosis in the liver, spleen, endocardium, myocardium and in the aborted fetus.
- In animals which abort, there is placentitis and endometritis.

Microscopically,

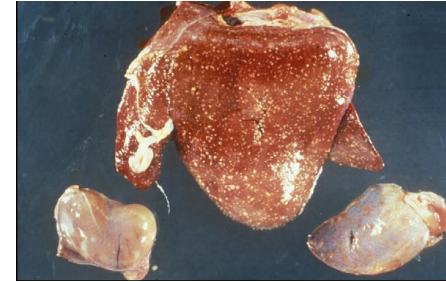
- The primary lesion is circumscribed collections of mononuclear cells, with or without neutrophils, around blood vessels
- Well-defined micro-abscesses may occur (are characteristic of the disease), but they are most common in sheep.



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LISTERIOSIS (CIRCLING DISEASE)



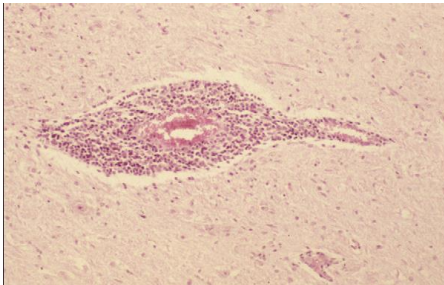
Post-mortem findings in a two-day-old lamb with septicaemia caused by listeriosis; presence of micro-abscesses on the heart, the liver and the kidneys.



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LISTERIOSIS (CIRCLING DISEASE)



Histopathological findings in the brain of a sheep caused by listeriosis; encephalitis with perivascular cuffing with lymphocytes.



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LISTERIOSIS (CIRCLING DISEASE)

Diagnosis

- CSF has an increased protein concentration (0.6-2.0 g/L [normal 0.3 g/L])
- Isolation and identification of *L. monocytogenes*

Differential Diagnosis

- Nervous form of Ketosis
- Brain abscess
- Rabies
- Ear infection
- Pseudorabies
- Viral encephalitis

Disinfection

- Is susceptible to 1% sodium hypochlorite, 70% ethanol or glutaraldehyde.
- It can also be killed by moist heat (121°C for 15 min) or dry heat (160-170°C for 1 hour).



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**THANKS FOR BEING SO NICE
AND SO ATTENTIVE!**

THE END

