Diagnostic Exercise

From The Davis-Thompson Foundation*

Case #**259**; Month: **April**; Year: **2025**

Answer sheet

Title: Canine pseudorabies

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History: A 3-year-old, female, Plott hound dog had a history of severe fascial pruritus, swelling, and drooling. The week prior, this dog and three other dog hunted feral hogs. At the time this dog was submitted for necropsy at the Louisiana Animal Disease Diagnostics Laboratory (LSU Diagnostics), the two other dogs had already died.

Necropsy findings: On the left frontal and temporal regions of the head extending down to the maxillary region, there were coalescing alopecic, dark red, irregular areas measuring up to 12 x 5 cm (Fig. 1). The subcutis within these regions and adjacent areas including the left submandibular and ventral cervical regions was expanded by edema and hemorrhage. The tonsils were mildly enlarged.

Histologic description:
Trigeminal ganglion: There were coalescing inflammatory foci composed predominantly of lymphocytes and histocytes that infiltrated in between nerve fibers and surrounded neuronal bodies, disrupting the ganglion architecture (Fig. 2). Neurons were hypereosinophilic, shrunken, and contained a karyolitic or pyknotic nucleus. In scattered neurons, there were occasional amphophilic intranuclear inclusions that measured up to 10 x 7.5 um and peripheralized the chromatin (Fig. 3).

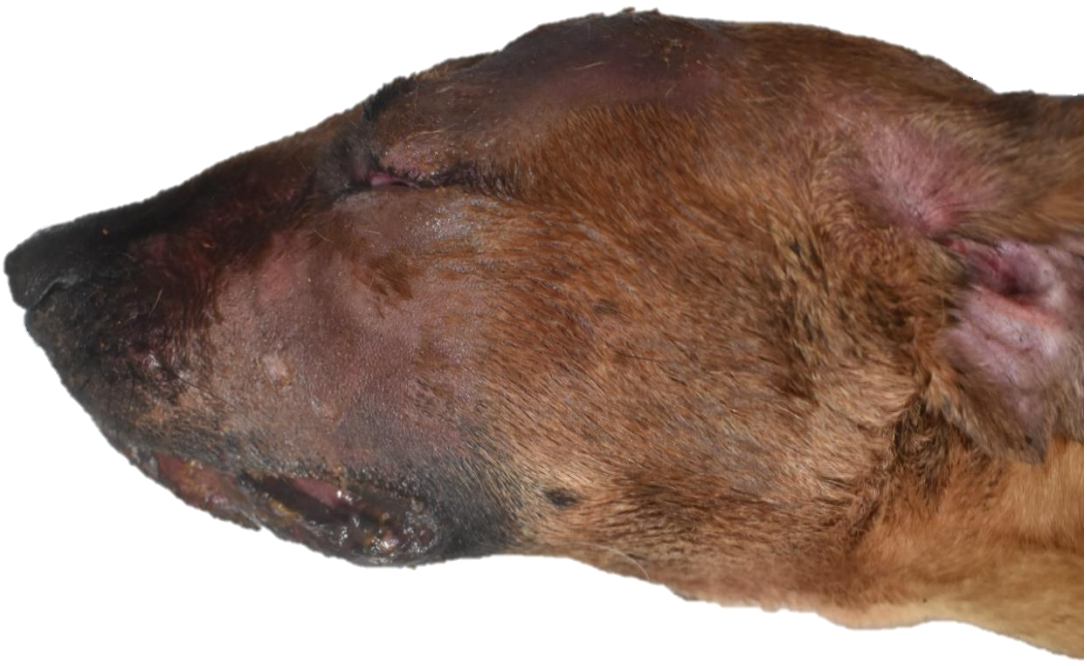

Figure 1 On the left frontal and temporal regions of the head and extending down to the maxillary region, there were coalescing alopecic, dark red, irregular areas measuring up to 12 x 5 cm

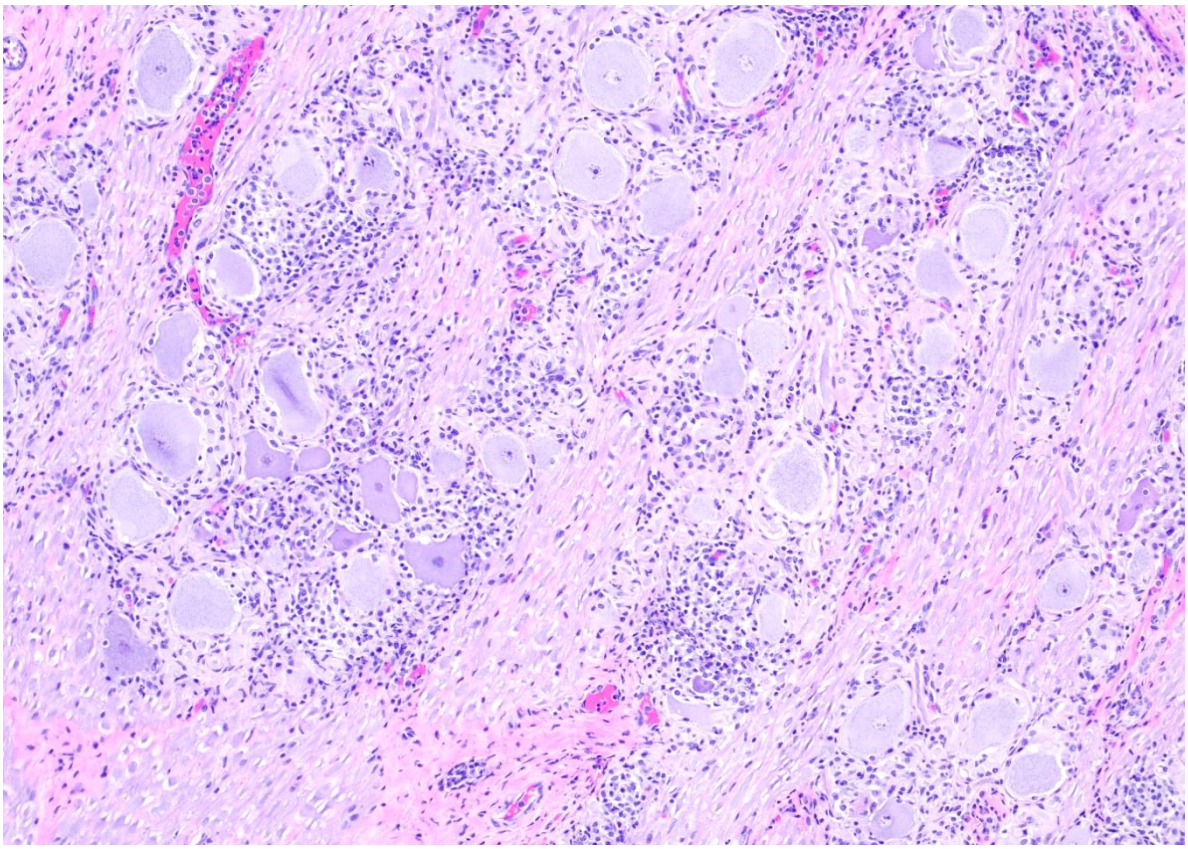

Figure 2: Trigeminal ganglion.

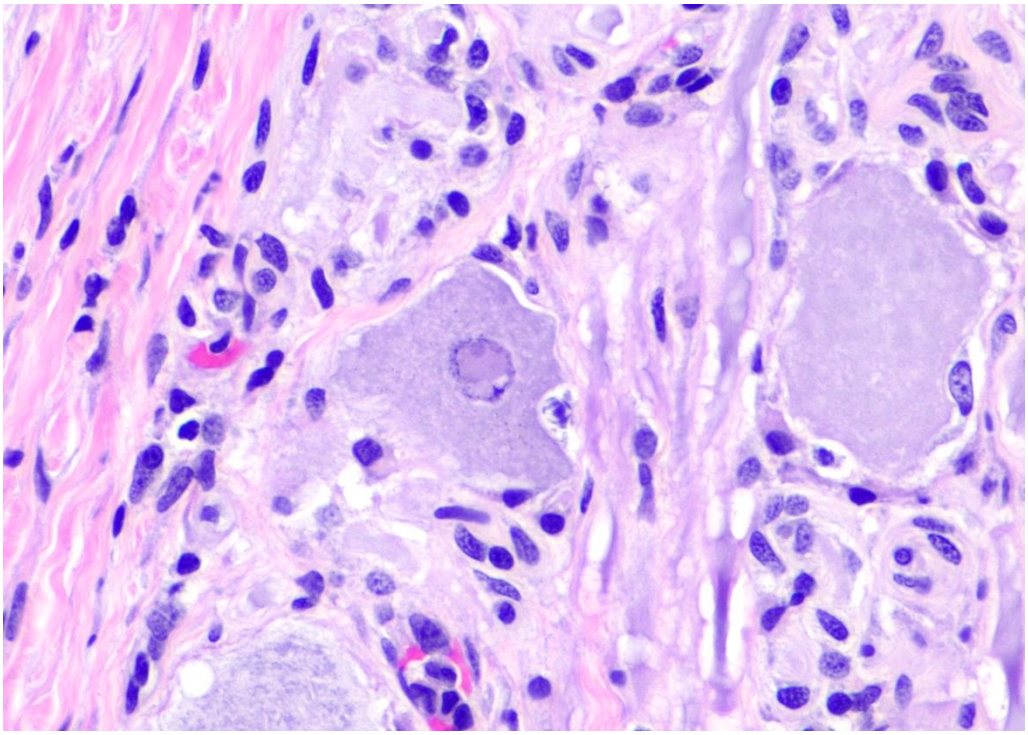

Figure 3. Trigeminal ganglion. Neuron withy intranuclear amphophilic inclusion body peripheralizing the chromatin.

Brainstem: There were randomly distributed, small glial nodules mixed with lymphocytes (Fig. 4) in the white matter tracts and grey matter nuclei. Adjacent to these areas were low numbers of lymphocytes and histiocytes surrounding blood vessels. There were occasional random neurons with intranuclear glassy eosinophilic inclusions, as well as rare degenerated and necrotic neurons. Within the cortex, glial cell numbers are subjectively increased and arranged occasionally in small nodules.

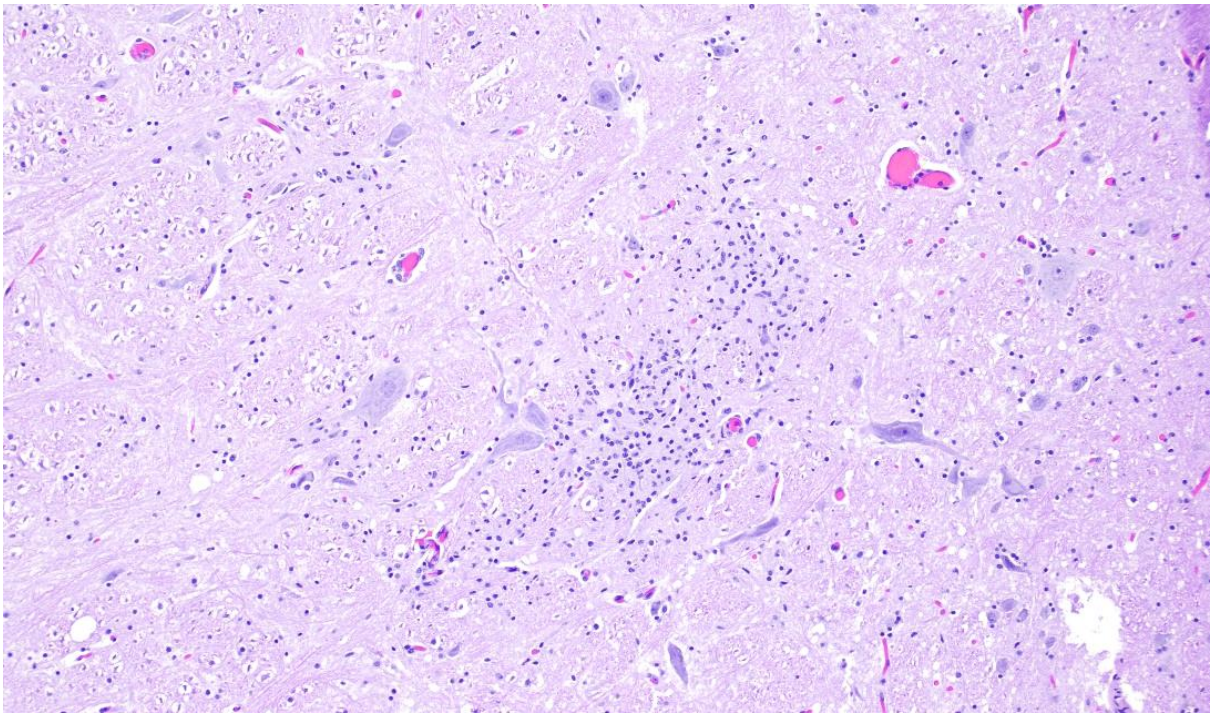

Figure 4. Brainstem. Glial nodule.

Molecular testing results:
Suid herpesvirus 1 (pseudorabies virus) detected via PCR from frozen brain samples.

Morphologic diagnoses:
● Trigeminal ganglion: Ganglionitis, lymphocytic and histiocytic, multifocal, marked, acute, with neuronal degeneration and intranuclear inclusion bodies in neurons.

● Brainstem: Rhombencephalitis, lymphocytic and histiocytic, multifocal, random, mild, with neuronal degeneration and necrosis, intranuclear viral inclusion bodies and multifocal gliosis.
Etiology: Suid herpesvirus 1

Name the disease: Pseudorabies (Aujeszky's disease, mad itch, porcine herpesvirus infection, or infectious bulbar paralysis)

Comments:
Pseudorabies virus (PRV), also known as Suid herpesvirus 1, is a member of the genus *Varicellovirus*, family *Orthoherpesviridae*, subfamily *Alphaherpesvirinae* (3) capable of establishing latent infections specifically in sensory ganglia (4). PRV is the causative agent of pseudorabies, a notifiable disease listed by the World Organization for Animal Health (O.I.E). Domestic and wild swine are the natural hosts for this disease; however, much effort has been put towards vaccine development and eradication programs to remove PRV from the commercial swine industry making wild boar populations the primary reservoir (6). Infection in swine typically results in subclinical signs and is fatal in all other susceptible mammals including canids and ruminants. In swine, age at the time of infection is an important determinant in severity of disease, with older pigs often demonstrating reproductive complications including abortion, fetal reabsorption, and mummification while younger pigs may develop nervous signs including convulsions and paralysis (2). Despite having a natural host, PRV lacks host specificity, and its presence within wildlife populations highlights the importance of understanding disease management and prevention at the domestic-wildlife interface. Common clinical signs in non-swine domestic animals include pruritus, jaw paralysis, diarrhea, vomiting, drooling, and muscle spasms (2,4,6).

Transmission of the virus by its natural host can be both direct and indirect, including nose-to-nose contact, fomites, and inhalation as well as vertical transmission. Across species from swine, transmission is often the result of consuming contaminated pork. Rarely is it demonstrated that PRV can be transmitted from non-swine species to other animals (2,4). As the domestic-wildlife interface continues to expand globally, reports of PRV in dead-end hosts also continue to increase in conjunction with the increase of its seroprevalence in wild swine (1). Additional documented cases in dogs include reports in Alabama, Arkansas, and Southern Italy. In Alabama, a dog developed severe pruritus leading to facial self-induced trauma and bleeding, progressing to vocalization, vomiting and death after participating in wild hog hunting; histopathologic examination of the brainstem revealed moderate lymphoplasmacytic rhombencephalitis, multifocal gliosis, and eosinophilic intranuclear inclusions within neurons and astrocytes (5). The report in Arkansas included 12 dogs, nine of which were used for hunting feral swine and three others who were fed game meat; a total of 10 of those animals died after developing self-traumatic lesions and swelling of the head, vomiting, and drooling (5). In Sicily, two dogs had similar pruritus, respiratory distress, and neurologic signs including muscle spasms and tetraparesis several days after being bitten by wild boar. Histologic findings were consistent with non-specific nonsuppurative meningitis, with shrunken, eosinophilic neurons with karyorrhectic or pyknotic nuclei in the brain and brainstem (1).

Gross lesions of PRV are nonspecific but due to itching, self-trauma may occur. Epithelial lesions include areas of coagulative or lytic necrosis in organs such as the

adrenals, liver, lungs, placenta, spleen, and tonsils. In swine, petechial hemorrhage can be observed throughout the body, prominently in lymph nodes, lung, kidneys, and brain. The lungs, kidneys, spleen, and tonsils may have small white foci of coagulative or lytic necrosis (2,6). In cattle, the most prominent lesions are pulmonary edema, skin and subcutis expanded by edema and hemorrhage, and meningeal edema and congestion. In other small ruminants, gross lesions may include pulmonary edema, hyperemic meninges, and petechial hemorrhages in the cervicothoracic ganglion (6). Gross lesions observed in dogs and cats again include hemorrhagic and edematous skin lesions extending from the epidermis into the subcutis resulting from self-trauma, congestion of the meninges, and pulmonary edema. Hemorrhage in the heart, lungs, pleura, kidneys, stomach, and small intestine may also be observed in addition to pulmonary and meningeal congestion. However, some animals may lack gross lesions (6).

Across species PRV is a neurotropic and epitheliotropic virus with consistent histologic lesions. In swine, the neurotropic inflammatory response is primarily lymphocytic and histiocytic with neuronal necrosis, neuronophagia, and satellitosis. Other characteristics include infiltration of the meninges and perivascular cuffing comprised primarily of lymphocytes, macrophages (6). Frequent findings also include ganglioneuritis in the trigeminal, spinal, and myenteric ganglia (6). Brain lesions are common in carnivores and ruminants; however, death may occur prior to degenerative inflammatory responses in the brain, but when present, the grey matter is often the region most affected (2). Canine neurotropic responses frequently affect the brainstem, trigeminal ganglia, autonomic plexi, and spinal cord. The response is characterized by perivascular cuffing by lymphocytes and macrophages, meningeal infiltration, neuronal necrosis, gliosis, neuronophagia, and satellitosis. Intranuclear inclusion bodies in both neurons and astroglia may be present in all species that are susceptible to the virus (2,6).

Prevention of PRV is achieved through vaccination of pigs, which confers protection against clinical signs, mortality, and viral shedding. Limitations of this method include the prevention of infection as the vaccines developed do not protect from the virus itself, thus hindering eradication efforts (4,6). In addition to vaccination programs, disease can also be prevented by avoiding direct and indirect exposure with reservoir hosts. Overall prevention of disease is limited.

References:

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*The Diagnostic Exercises are an initiative of the Latin Comparative Pathology Group (LCPG), the Latin American subdivision of The Davis-Thompson Foundation (DTF). These exercises are contributed by members and non-members from any country of residence. Consider submitting an exercise! A final document containing this material with answers and a brief discussion will be posted on the DTF website.

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