**Classic case:** 5-month-old mixed breed dog with lethargy, ocular and nasal discharge, cough, vomiting, and diarrhea

**Presentation:**
- **Signalment and History**
  - **Dogs**
    - Usually urban or suburban
    - Usually YOUNG - between 3 and 6 months of age
    - More common, with higher mortality in dolichocephalic (long nose) breeds versus brachycephalic breeds
  - **Ferrets** – unvaccinated at any age
  - Also infects coyote, dingo, wolf, fox, mink, skunk, raccoon, panda, lion, cheetah, jaguar, margay, ocelot

- **Generalized distemper** in dogs – lethargy, poor haircoat, dehydration
  - Respiratory and ocular signs first
    - Ocular and nasal discharge (serous or mucopurulent)
    - Cough, loud breath sounds
    - Keratitis, conjunctivitis, uveitis
  - Gastrointestinal signs second
    - Inappetence, vomiting, diarrhea
  - CNS signs third (usually 1-3 weeks later, but can be months)
    - Seizures – “chewing-gum” seizures to generalized
    - Ataxia
    - Vestibular symptoms
    - Cerebellar symptoms
    - Paresis
    - **Myoclonus** – rhythmic twitching of the head, neck, or one or more limbs

- Canine survivors may develop
  - **Hyperkeratosis** of footpads (hardpad) and nasal planum
  - **Enamel hypoplasia** (if disease occurred during enamel development)
  - **Old-dog encephalitis** Ataxia, compulsive walking, head-pressing, hypermetria

- **Distemper encephalomyelitis** may occur in older dogs with no history of systemic disease and adequate vaccination history. This is different from old-dog encephalitis. Usually cerebellar and vestibular symptoms.

- **Inclusion-body polioencephalitis** can occur after vaccination – similar to sx of old-dog encephalitis

- Transplacental infections in dogs – abortion or stillbirths; puppies that survive develop neurologic signs by 6 weeks and may have lifelong immunodeficiency
Presentation: (continued)
- Ferrets
  - **Papular chin dermatitis**, cheilitis with swelling and crusting, perineal dermatitis (may be orange-tinged) – **dermatitis is pathognomonic when other symptoms are present**
  - Anorexia, depression, dyspnea, pyrexia, photophobia,
  - Pruritis, mucupurulent oculonasal discharge
  - Hyperkeratosis of planum nasale and footpads
  - Vomiting and diarrhea are uncommon
  - Advanced stages – incoordination, torticollis, nystagmus

**DDX:** Canine infectious tracheobronchitis, parvoviral enteritis, leptospirosis, infectious canine hepatitis, Rocky Mountain spotted fever, organophosphate or lead toxicosis, other CNS diseases of young dogs, influenza in ferrets

**Test(s) of choice:**
- Presumptive diagnosis in a young, unvaccinated dog with
  - Oculonasal discharge,
  - Vomiting, diarrhea, ± neurologic signs
- CBC – absolute lymphopenia
- Thoracic radiographs – interstitial pattern
- Serum IgM titers in unvaccinated dogs confirm recent exposure or current infection
- CSF
  - Elevated protein
  - Lymphocytic pleocytosis
  - Positive distemper antibody titers (only if no blood contamination)
  - If blood contamination:
    - Paired samples of CSF and serum are tested for canine distemper virus (CDV) and parvovirus (CPV) antibody titers
    - Ratio of CDV/CVP higher in CSF than in blood is suggestive of infection
- Fluorescent antibody – cytologic smears (**conjunctival**, tonsils, CSF, bone marrow, urine sediment)
- PCR for CDV – whole blood, serum, CSF
- RT-PCR of buffy coat, conjuctival, preputial or vaginal swabs
- Post-mortem – fluorescent antibody testing as above, including brain

**Rx of choice:**
- Supportive care, antibiotics for secondary infections, anticonvulsants
- Corticosteroids for optic neuritis, encephalitis **without** systemic dz

**Prognosis:**
- Guarded to poor – worse prognosis with CNS signs;
- Ferrets usually have a grave prognosis
Canine Distemper
Extended Version

Prevention:
- **Dogs:** Modified-live canine distemper vaccine every 3-4 weeks
  - From 6 weeks of age through 16 weeks, then annually
  - Immunocompromised dogs may still develop disease
  - Dogs exposed to a large amount of a highly virulent strain may STILL develop disease
  - Vaccine-induced infections are very rare and will only cause neurologic symptoms
  - **Complications** (mostly *Weimaraners* are affected) are rare (hypertrophic osteodystrophy and juvenile cellulitis) within 10 days of vaccine
  - *Weimaraners* may also develop a corticosteroid-responsive neutrophilic meningitis/arteritis
  - Recombinant CDV vaccine recommended for young *Weimaraners* (usually no problems after a year of age)

- Prevent spread from infected dog
  - Isolate from other patients; wear gowns and gloves
  - **Thoroughly disinfect** all potential fomites (e.g. nebulization equipment)
    - CDV is fragile
    - Sensitive to most disinfectants
  - Isolate infected dogs from healthy dogs for at least 2 weeks after disappearance of clinical sx

- **Ferrets:**
  - PureVax Ferret Distemper Vaccine (recombinant canary-pox vector vaccine)
  - Do **not** use multivalent canine vaccines in ferrets!

Pearls:
- Caused by *morbillivirus* of the family *Paramyxoviridae* (closely related to measles and rinderpest)
- **Highly contagious** via aerosol, transplacental routes, or by direct contact w/ secretions, esp. fomites
- Viral shedding begins by 7th day and may persist **up to 90 days**
- **Old-dog encephalitis** likely due to persistent viral inf. of CNS gray matter
- “Chewing-gum” seizures are **NOT** pathognomonic for distemper-can be due to any cause of seizures

*Lung lesions in an African wild dog with canine distemper. Bronchiole occluded by inflammatory cells (A). Detail of A, showing eosinophilic intracytoplasmic viral inclusions (B).*

*Image courtesy, CDC and Wikimedia Commons.*
Pearls: (continued)

- **Pathophysiology of Distemper**
  - Viral replication in upper-respiratory epithelium tissue macrophages
  - Virus multiplies in tonsils and retropharyngeal and bronchial lymph nodes via lymphatics
  - Systemic dissemination via mononuclear cells – 3-6 days after exposure
    - Fever
    - Leukopenia
  - Viremia, hematogenous spread (day 9) to epithelial & CNS tissue
    - Adequate humoral and cell-mediated immunity: Dog may clear virus by day 14
    - Intermediate immunity – infection of epithelial tissues by day 14
      - Clinical signs develop and resolve
      - Virus is cleared from most tissues (may persist in footpads and CNS)

- Poor immunity: viral spread to skin, endocrine glands, exocrine glands, epithelial cells of intestinal tract, respiratory system, and genitourinary tract by day 14