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Feline Panleukopenia

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Feline panleukopenia or feline infectious leukopenia or feline typhus or feline parvovirosis.

Infectious, virulent, contagious disease, specific to felids.

Affecting mainly young cats.

Recognized worldwide.

Caused by a Parvovirus; manifests in most cases as:

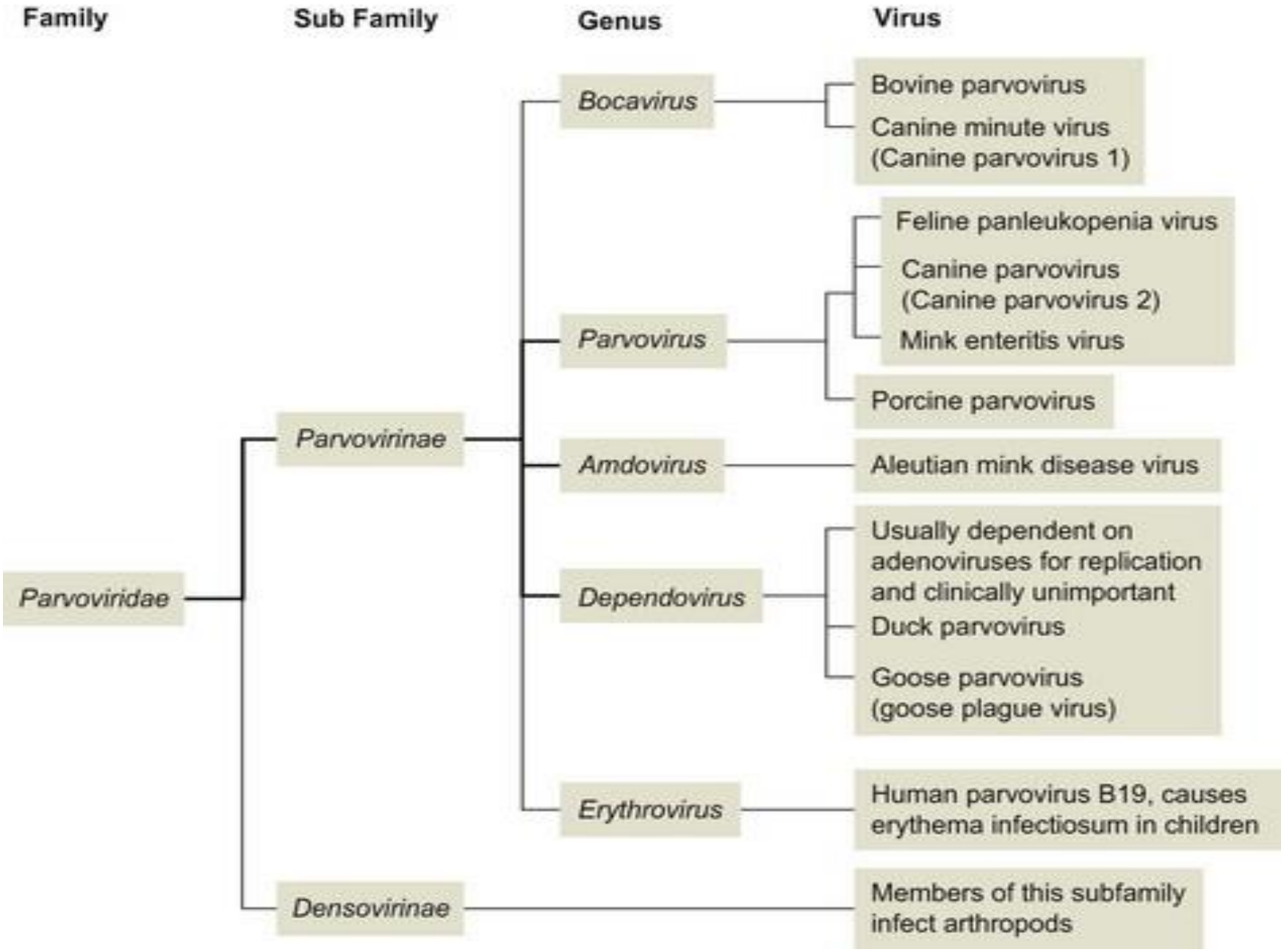
- State of intense prostration (typhoid state).
- Signs of acute gastroenteritis.
- Severe leukopenia.
- High mortality.

The Feline Parvovirus infecting pregnant females is responsible for cerebellar hypoplasia leading to the birth of ataxic kittens = cerebellar ataxia of the kitten (in utero contamination).

Etiology

The Feline Panleukopenia Virus (FPV):

- Family of Parvoviridae.
- Subfamily of Parvovirinae.
- **Genus Protoparvovirus.**


Family
Sub Family
Genus
Virus
Parvoviridae
Parvovirinae
Densovirinae
Bocavirus
Parvovirus
Amdovirus
Dependovirus
Erythrovirus
Bovine parvovirus
Canine minute virus
(Canine parvovirus 1)
Feline panleukopenia virus
Canine parvovirus
(Canine parvovirus 2)
Mink enteritis virus
Porcine parvovirus
Aleutian mink disease virus
Usually dependent on
adenoviruses for replication
and clinically unimportant
Duck parvovirus
Goose parvovirus
(goose plague virus)
Human parvovirus B19, causes
erythema infectiosum in children
Members of this subfamily
infect arthropods

Within the genus Parvovirus, several types are distinguished:

- **Feline parvovirus: FPV = Feline Panleukopenia Virus**
- Canine parvovirus: CPV2 and CPV1 (Carnivore bocaparvovirus 1).

Parvoviruses are small single-stranded DNA viruses, non-enveloped, with a diameter of about 20 nm (+/- 4 nm).

The virion (or complete viral particle) is composed of an icosahedral protein capsid.

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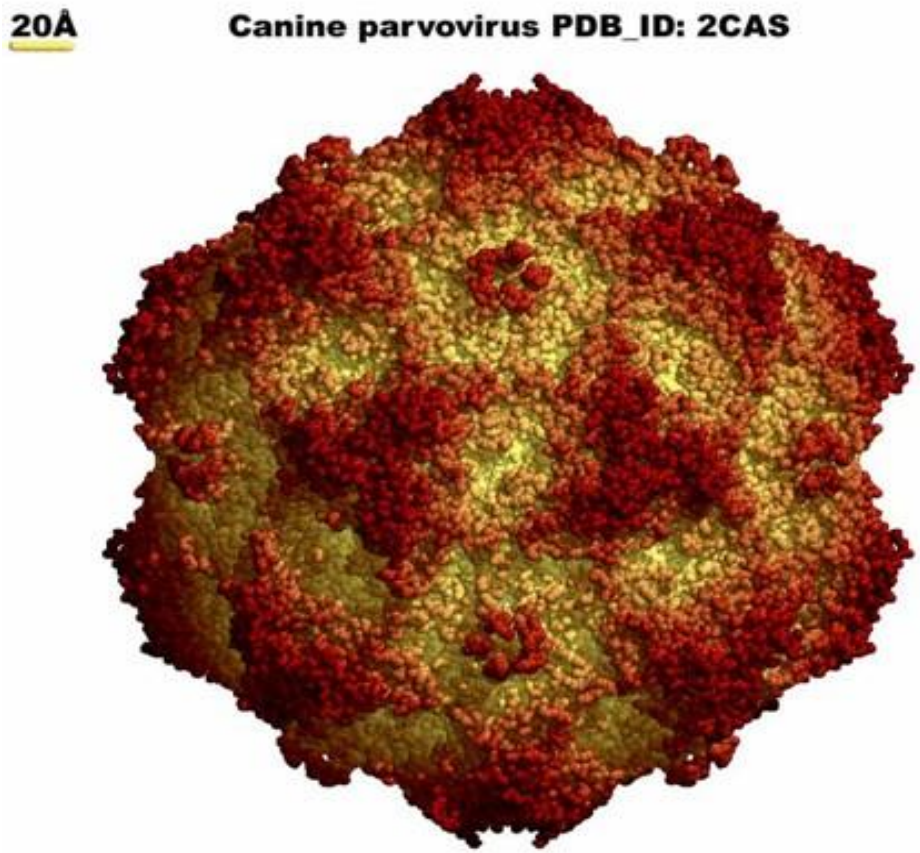
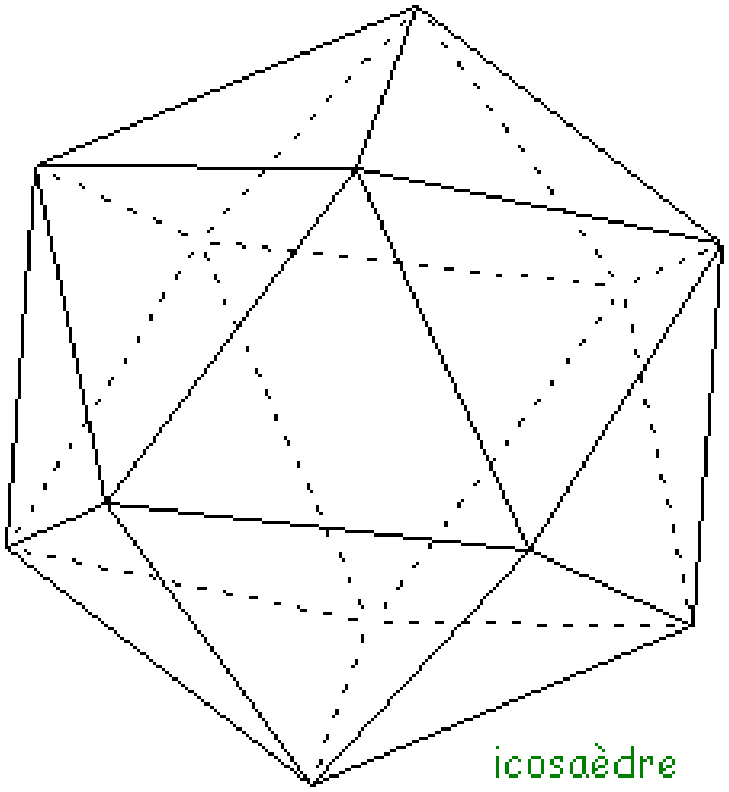
The capsid of the feline parvovirus forms an icosahedron.





❖Properties of FPV

FPV is very stable (highly resistant):

- Capable of surviving for 1 year at room temperature in organic matter and on solid passive vectors.
- Outside, parvoviruses present in fecal organic matter can survive for 5 to 10 months or more.

- Resistant to 56 °C for 30 minutes and remains alive longer at lower temperatures.
- It survives disinfection with: 70% alcohol, various dilutions of organic iodine, phenolic compounds, and quaternary ammonium compounds.

The virus is inactivated in 10 minutes at room temperature in dilutions:

- **Household bleach (3%, 5.25% sodium hypochlorite).**
- 4% formaldehyde, peracetic acid, sodium hydroxide (0.1 M at pH 12.8 or higher), 1% glutaraldehyde

- For thermal disinfection of parvoviruses: temperatures of at least 90 °C are required for 10 minutes.
- Heat and drying during the summer months, along with the separation of organic debris, accelerate virus inactivation.

Epidemiology

The virus is ubiquitous due to its contagious nature and its ability to persist in the environment.

❑Sources of the pathogen

The secretions and excretions of sick individuals, especially feces, represent the primary source of the pathogen:

- Feces contain a large amount of pathogens.
- The virus can also be found in other excretions and secretions: urine, respiratory droplets, saliva, nasal discharge, aborted fetuses.

The virus can also be present on the animal's fur.

Individuals showing the subclinical form of the disease are excretors of the virus.

The virus's very high resistance in the external environment allows for the existence of other viral sources:

- ✓ Humans, contaminated cages, food bowls, food, litter, equipment and instruments, shoes and clothing of people in contact with the sick animal (breeder, veterinarian), etc.

❑ Excretion of the virus

The virus is largely excreted in feces from the dissemination phase in the intestinal tissues, just after the viremia phase = 3 to 4 days PI.

Infected animals can excrete the virus more than 6 weeks after infection.

❑Sensitive species

FPV can cause disease in all felids.

Some Viverridae, Procyonidae, and Mustelidae: binturong (bear cat), raccoon, marten, are also sensitive.

❑Receptiveness

Non-immunized cats during the first year of life are sensitive and are exposed to and infected by it.

Occasionally, clinical cases are noted in non or poorly immunized adults (often in communities).

Young cats from 2 months to one year are the most sensitive.

In adulthood, most cats acquire active immunity:

- Through vaccination.
- Following a subclinical infection.

Note:

Selected cat breeds seem to be more sensitive to the disease.

❑Transmission

➢Direct transmission

- **Horizontal**

Requires close contact:

Between the healthy animal and the virus excreting animal (sick, inconspicuous infected animal).

Entry site of the virus: Oronasal route, the virus can also be inhaled.

- **Vertical**

There is also vertical transmission from the mother to the fetus through the trans-placental route.

➢ Indirect transmission

Between the healthy animal and the contaminated environment and/or object:

Facilitated by passive vectors (inanimate objects), and by active vectors (insects).

❑Mortality

Mortality is particularly high:

- In young cats < 1 year: 80-90% (cases of an acute form).
- 40%: Animals older than one year.

Pathogeny

Infection by FPV is based on the selective affinity of the virus for dividing cells: Actively dividing cells (in full differentiation).

The distribution of lesions is therefore related to the turnover rate of the different cellular populations.

This turnover rate varies depending on the age; this explains the different clinical aspects:

Infection occurs:

- In peri-partum: Particular sensitivity of the cerebellum, resulting in ataxia.
- Kittens a few weeks old: Specific sensitivity of the reticuloendothelial system and to a lesser extent of the digestive tract.
- Young adult: Mainly multiplication in enterocytes.

The progression of the virus can be divided into 3 successive phases:

- After contamination by inhalation or ingestion, the 1st phase of primitive replications occurs in the oropharynx, in the tonsils and local lymph nodes (1 to 3 days PI).

- Then, the virions are disseminated by lymphocytes into the bloodstream (viremia).

In kittens, this viremia can be stopped by AOM.

- Finally, the 3rd phase corresponds to secondary replications in cells with intense mitotic activity:

- Lymphoid tissue (Immunosuppression): Lymph nodes, Peyer's patch, thymus, spleen, and bone marrow with destruction of the stem cells of the white lineage leading to Panleukopenia.

- Digestive tract (small intestine colon): delayed compared to the previous sites.

The infection of the intestinal epithelium in the dividing cells of the crypts of the intestinal villi of the ileum and jejunum occurs between the 3rd and 5th day PI.

The virus invades the entire epithelium of these intestinal portions within 4 to 8 days PI.

Preventing cell regeneration: Destruction of the epithelium (short intestinal villi), leading to a loss of osmotic regulation, which causes the mucohemorrhagic diarrhea often observed in sick individuals.

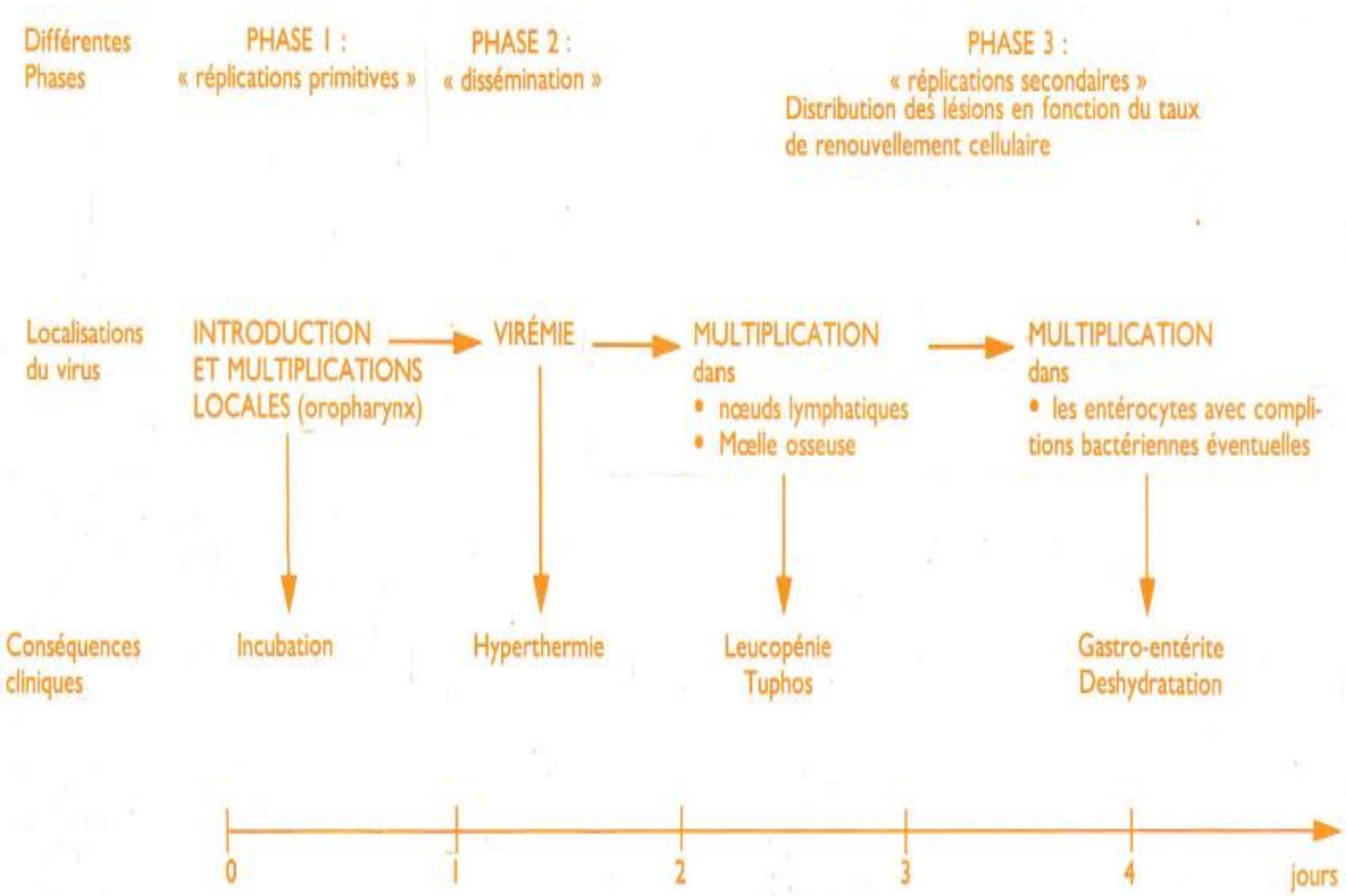
Symptoms may be aggravated in cases of co-infections with bacteria (Clostridium piliforme, Salmonella) or viruses (coronavirus) or by the presence of parasites.

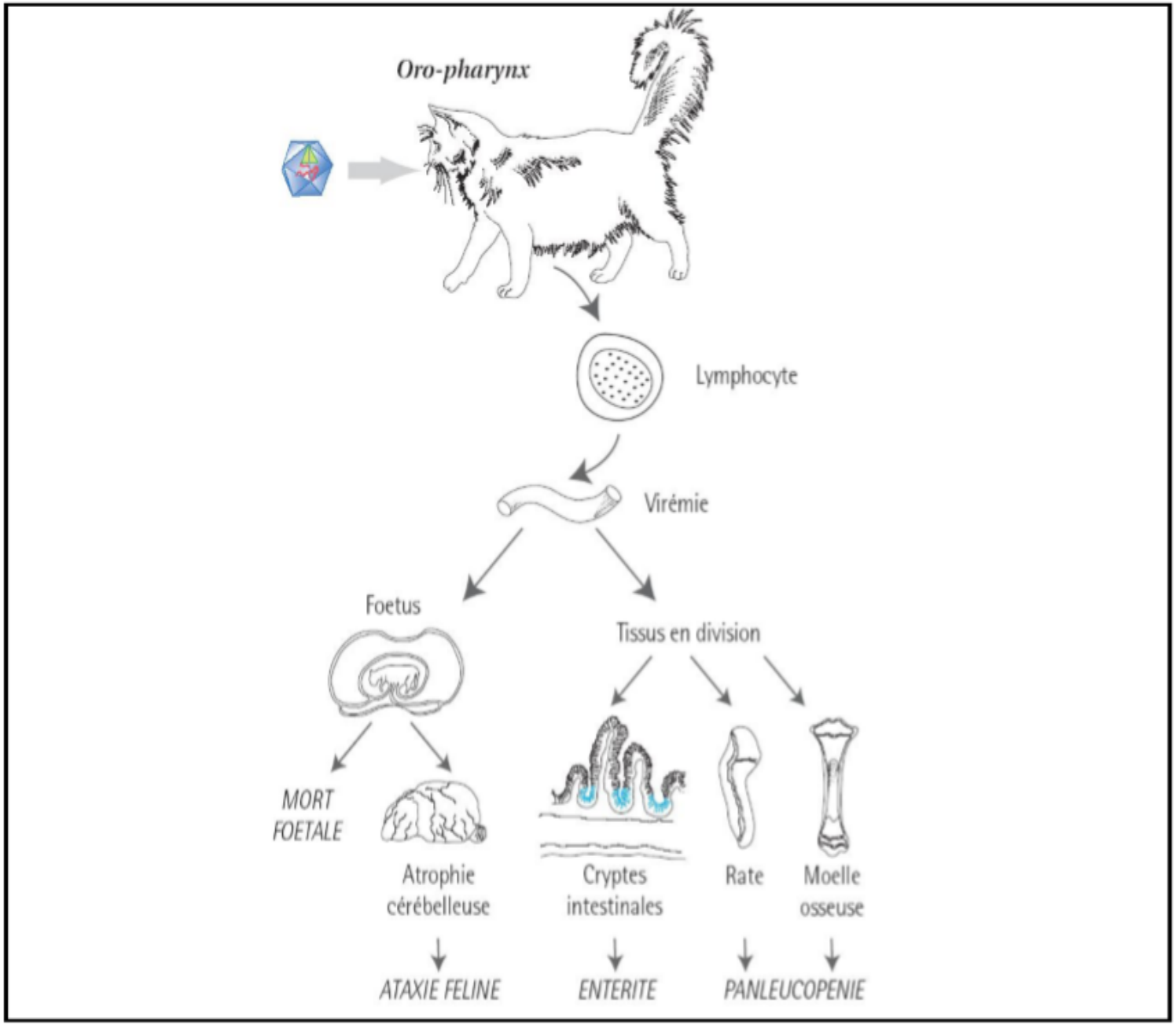
- Cerebellar ataxia: Due to the destruction of the granular layer of the cerebellum = Cerebellar hypoplasia.

Indeed, the cellular differentiation of this organ only completes around the 3rd week of life, and cell multiplication is intense at the time of birth.

This form is rare, occurring in kittens during perinatal infection:

- ✓Kittens that have not absorbed colostrum.
- ✓Kittens from non-immunized mothers.
- ✓In utero infection of the fetus.


Différentes Phases
PHASE 1 : « réplications primitives »
PHASE 2 : « dissémination »
PHASE 3 : « réplications secondaires »
Distribution des lésions en fonction du taux de renouvellement cellulaire
Localisations du virus
INTRODUCTION ET MULTIPLICATIONS LOCALES (oropharynx)
VIRÉMIE
MULTIPLICATION dans
• nœuds lymphatiques
• Mœlle osseuse
MULTIPLICATION dans
• les entérocytes avec complications bactériennes éventuelles
Conséquences cliniques
Incubation
Hyperthermie
Leucopénie Tuphos
Gastro-entérite Deshydratation
0
1
2
3
4
jours


Oro-pharynx
Lymphocyte
Virémie
Foetus
Tissus en division
MORT FOETALE
Atrophie cérébelleuse
Cryptes intestinales
Rate
Moelle osseuse
ATAXIE FELINE
ENTERITE
PANLEUCOPENIE

Clinical study

The symptoms of feline panleukopenia are varied and depend on:

- The virulence of the virus.
- The age and resistance of the host.
- Associated bacterial and/or viral complications.

Two main clinical forms are distinguished:

- Classic form: Gastroenteritis associated with leukopenia.
- Atypical form dominated by neurological signs, present in newborns.

❖**Gastroenteritis and leukopenia**

Mainly found in kittens aged 2 months to 1 year, but can also affect non-immunized adults.

❑Acute form

Especially in kittens aged 2 to 3 months (the AOM disappears between 8-12 weeks).

Often confused with poisoning:

Affected individuals indeed show high hyperthermia quickly followed by hypothermia.

Typhoid state (depression, a sternal-abdominal position, and the head resting on the outstretched forelimbs) frequently ends with the animal's death in 12-14 hours.

❑Acute form (classic form)

The most characteristic:

- Very short incubation: 18 to 24 hours.
- Prodromal phase: Sudden onset with marked hyperthermia (40°C) most often of short duration, anorexia, and intense prostration (typhoid state).

The cat does not move anymore, generally remains stretched out in a sphinx position, with its nose pressed to the ground between its two outstretched forelimbs.

Most often the cat seeks a cool surface to lie on, such as the tile of a kitchen for example.

Manipulation raises weak complaints without defensive reactions.

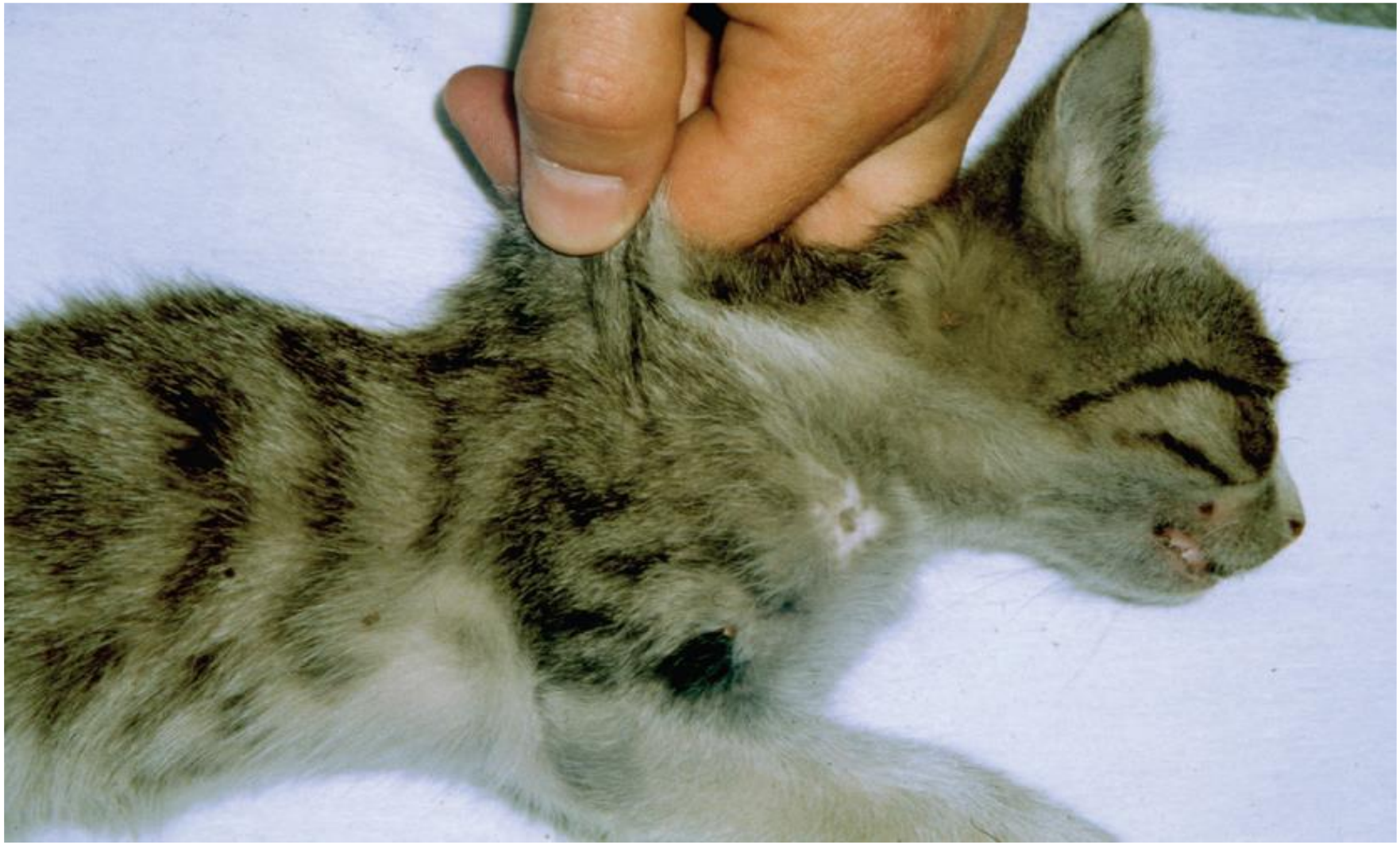
Vomiting generally appears at this prodromal phase.

- State phase: Associated with the typhoid state and enteritis symptoms that begin after 1-2 days of progression.

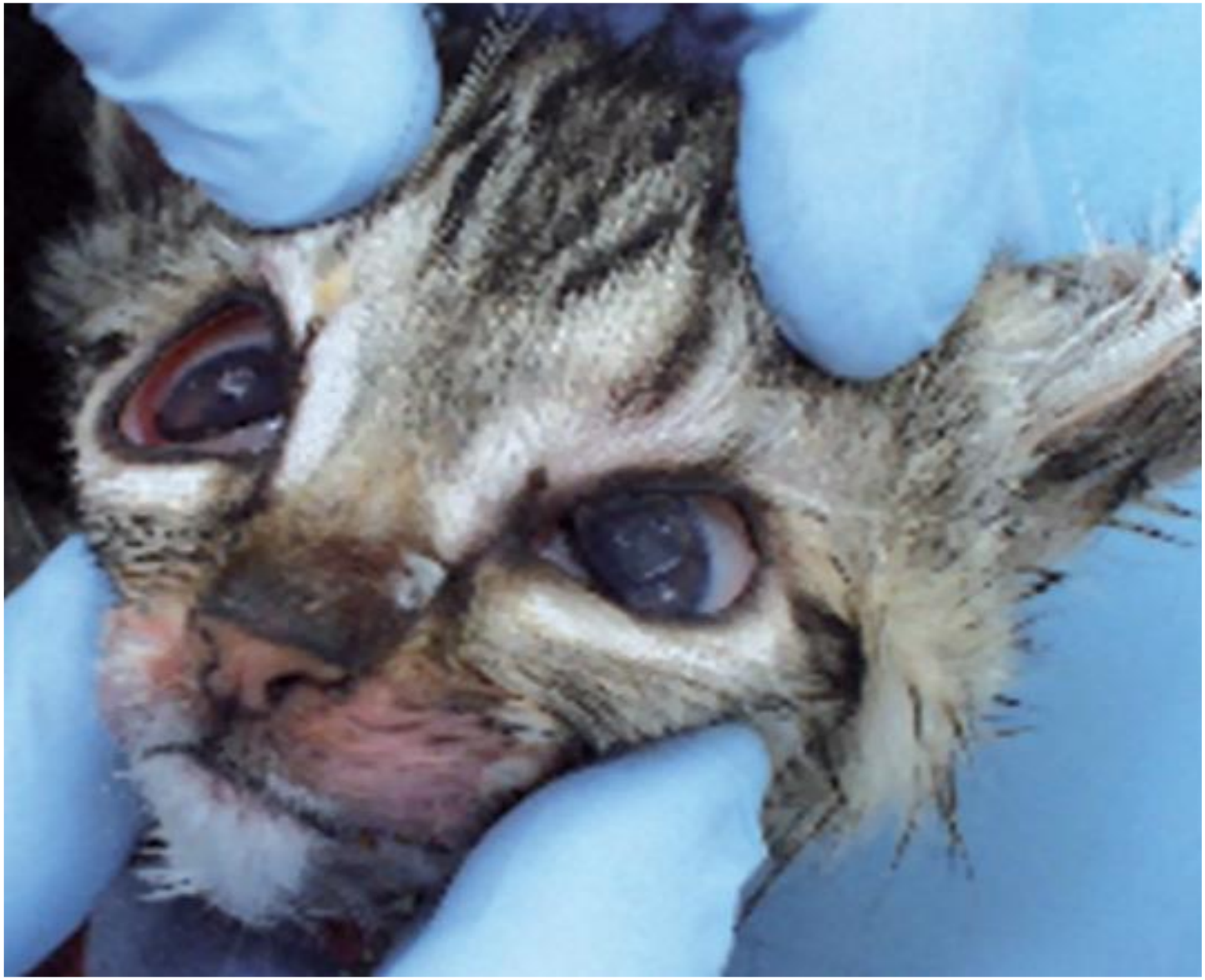
More frequent vomiting: Foul-smelling consisting of yellowish fluid or bile; or frothy from duodeno-gastric origin.

Very watery diarrhea, yellowish possibly tinged with blood, causing:

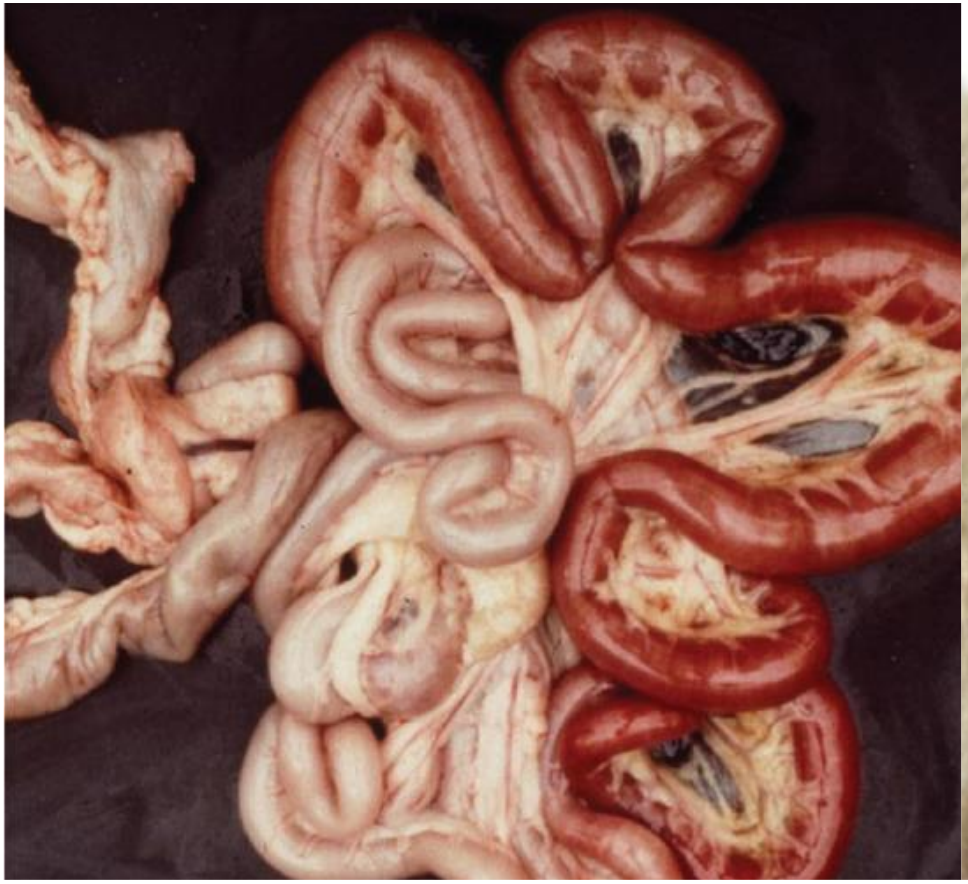
A very intense state of dehydration (extracellular or global) = Marked skin fold + sunken eyeballs + protrusion of the third eyelid (dry, grayish in color), dry mucous membranes.

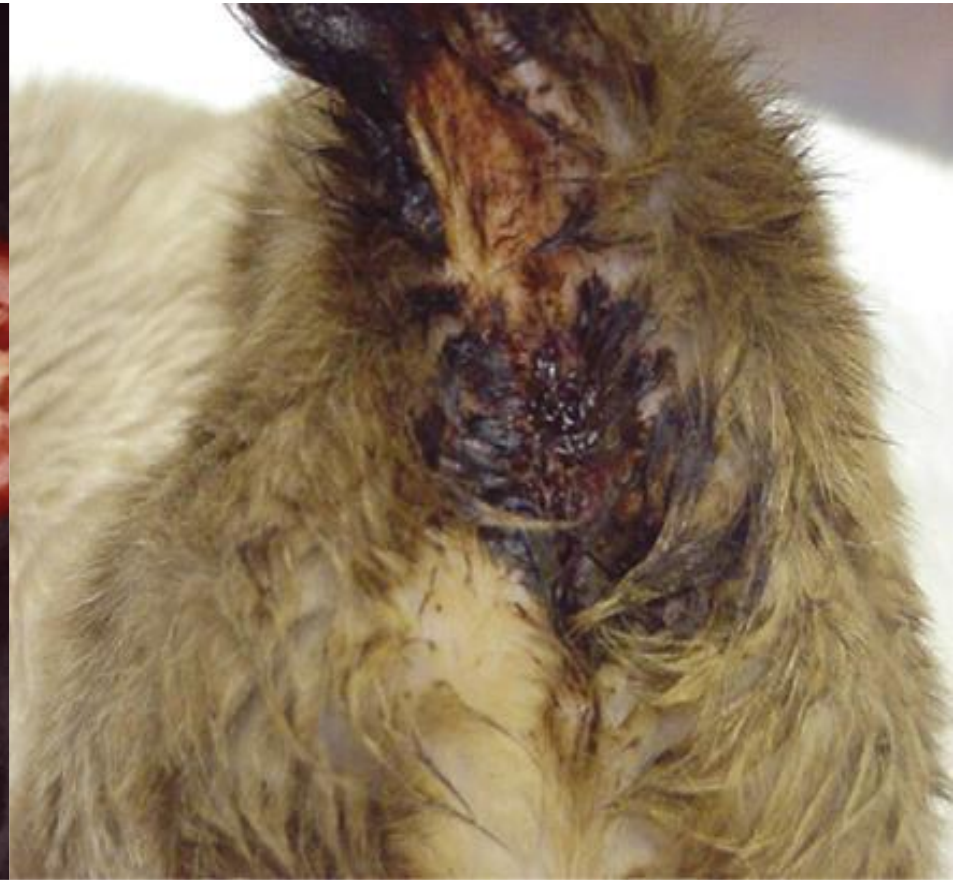


High mortality (up to 90%) accompanied by dehydration is a characteristic of feline panleukopenia in kittens.



Dehydration and vomiting are important clinical signs of feline panleukopenia.





Hemorrhagic enteritis is a common feature of feline panleukopenia, leading to the characteristic clinical manifestation of hemorrhagic diarrhea.

Abdominal palpation, often painful for the animal, allows for the detection of gas and intestinal fluid.

At this stage, the temperature decreases and often becomes < 37°C.

The animal is in a typical state.

It shows a 'pitiful' condition, its fur is dull and bristled, it seems thirsty (often places itself near the water bowl, but does not drink).

Leukopenia begins in the prodromal phase:

- ✓Essentially the neutrophils.
- ✓Lymphocytes disappear late.

Values <3000 leukocytes/mm³ are the norm (4,000 to 11,000 per mm³ of blood).

In the most severe cases (especially young ones) about = 1000 leukocytes/mm³, or even less.

Note:

The lower the leukocyte count, the more unfavorable the prognosis tends to be.

In surviving cats, the white blood cell count significantly rises within a few days.

The progression of the disease can lead to the death of the animal.

Usually preceded by significant hypothermia.

Death may sometimes occur before the observation of diarrhea = May be due to:

- ✓ Dehydration and electrolyte imbalances caused by intense vomiting.
- ✓ Onset of sepsis or endotoxemia associated with Disseminated Intravascular Coagulation (DIC).

❑Benign form

The benign form is observed in receptive adults (cats > 1 year unvaccinated; immunocompromised elderly cats) or in young cats during infections by weakly virulent strains.

It is associated with temporary hyperthermia, anorexia, possible diarrhea, and moderate leukopenia.

- Subclinical forms

Inapparent forms are the most common since most adult cats, even unvaccinated ones, show immunity without a direct pathological history.

❖**Nervous form**

The cerebellum is an organ that controls the coordination of movements

=

Its failure is characterized by abnormalities in the coordination and

Concerns newborn kittens born from an infected female (often inapparent) or in contact with her in the first days of life.

It has become rarer nowadays and may follow the vaccination of a pregnant female with a live attenuated vaccine.

NB:

- ✓ Generally, the entire litter is affected.
- ✓ Not all kittens in the same litter are necessarily affected.
- ✓ Infection of the fetus in utero during the last third of gestation results in the birth of ataxic kittens; the disorder is visible as soon as the kittens begin to be active: between 1 month and 14 weeks of age.

At rest: The animals seem normal. However, spectacular disturbances appear as soon as they make the slightest movement.

Standing:

- They hold their legs apart and their body undergoes large oscillations, back and forth or side to side.
- When they fixate on an object, their head is shaken by rapid fine tremors (intentional tremors).

When executing an action (walking, eating for example):

- They exhibit dysmetria (especially hypermetria: Movements are not adjusted to the intended target and have exaggerated amplitude).
- When they risk falling, these animals catch themselves with a delayed, violent, and exaggerated movement.

- The kittens do not have nystagmus.
- They have no sensory disturbances.
- The mentality is perfectly normal (the animal's mental status is not affected); they are interested in their environment, recognize their owner, try to play but they tire quickly.
- NB:

In a few months, certain disorders fade away.

The hypermetropia persists and these patients cannot hunt or defend themselves.

Lesions

❖Gastroenteritis and leukopenia

➢Macroscopically:

- Dehydrated corpse.
- Empty, dilated, and edematous intestine; thickened and inflamed mucosa, even hemorrhagic (Jejunum, ileum, possibly the colon).
- Lymph nodes (visceral and particularly the mesenteric) hypertrophied and hemorrhagic upon sectioning.

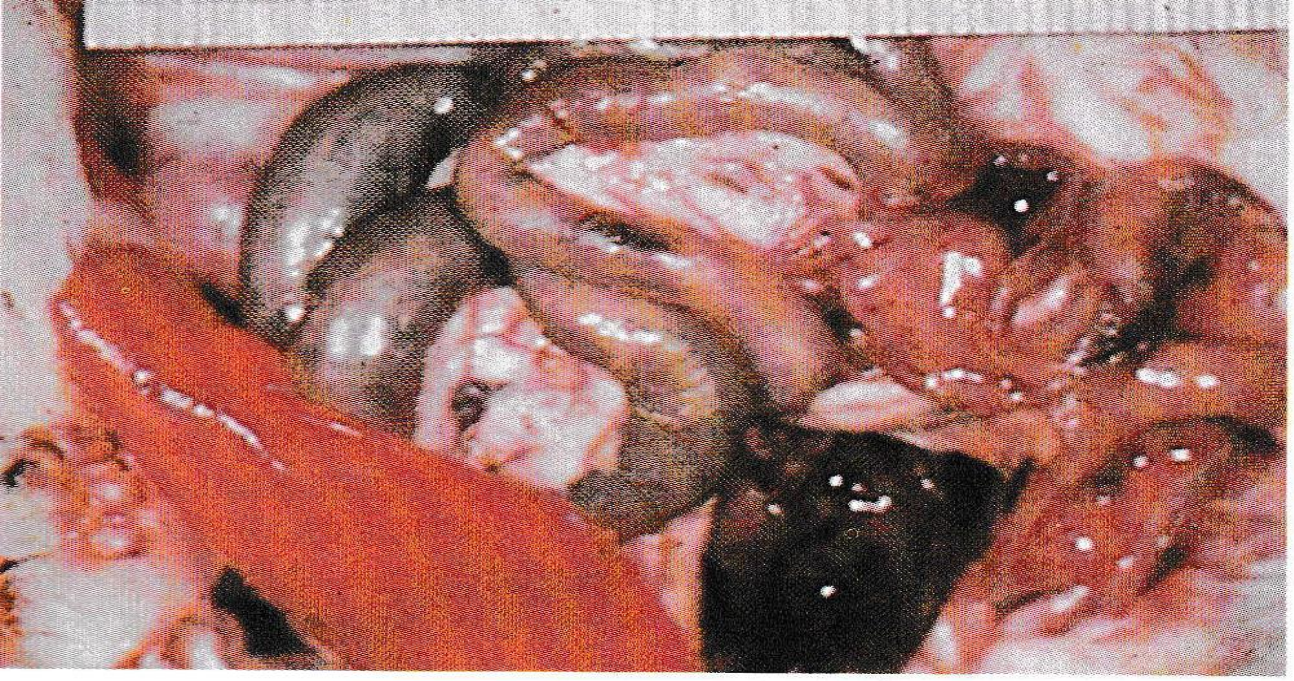


Photo 2 : Présence de pétéchies et de suffusions sur le péritoine viscéral (cliché Scott et Gillespie).

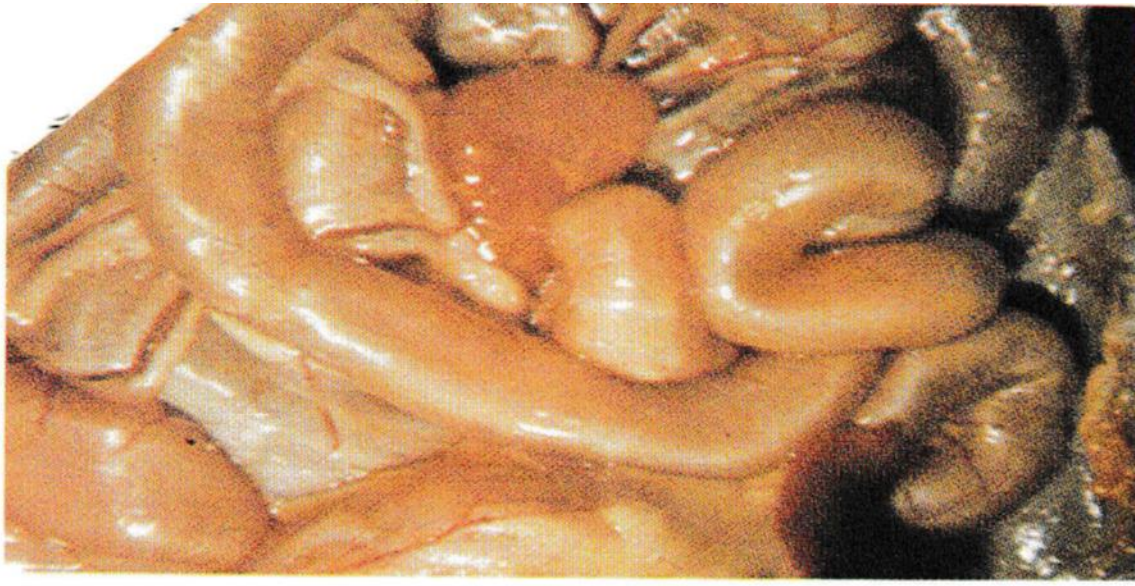
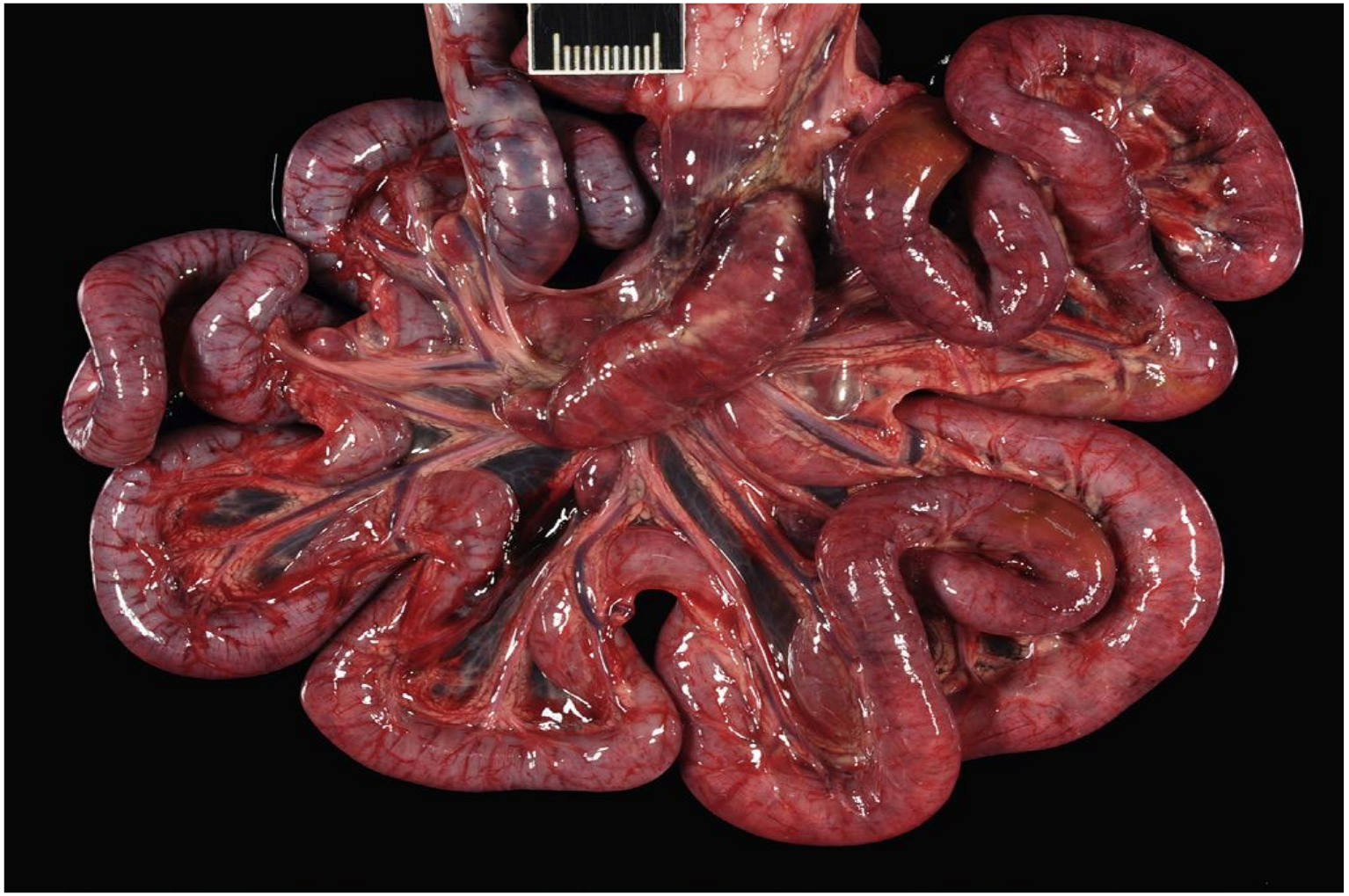


Photo 1 : Aspect lésionnel typique du tube digestif lors de leucopénie infectieuse : l'intestin apparait dilaté et la paroi œdématiée (cliché ENVL).

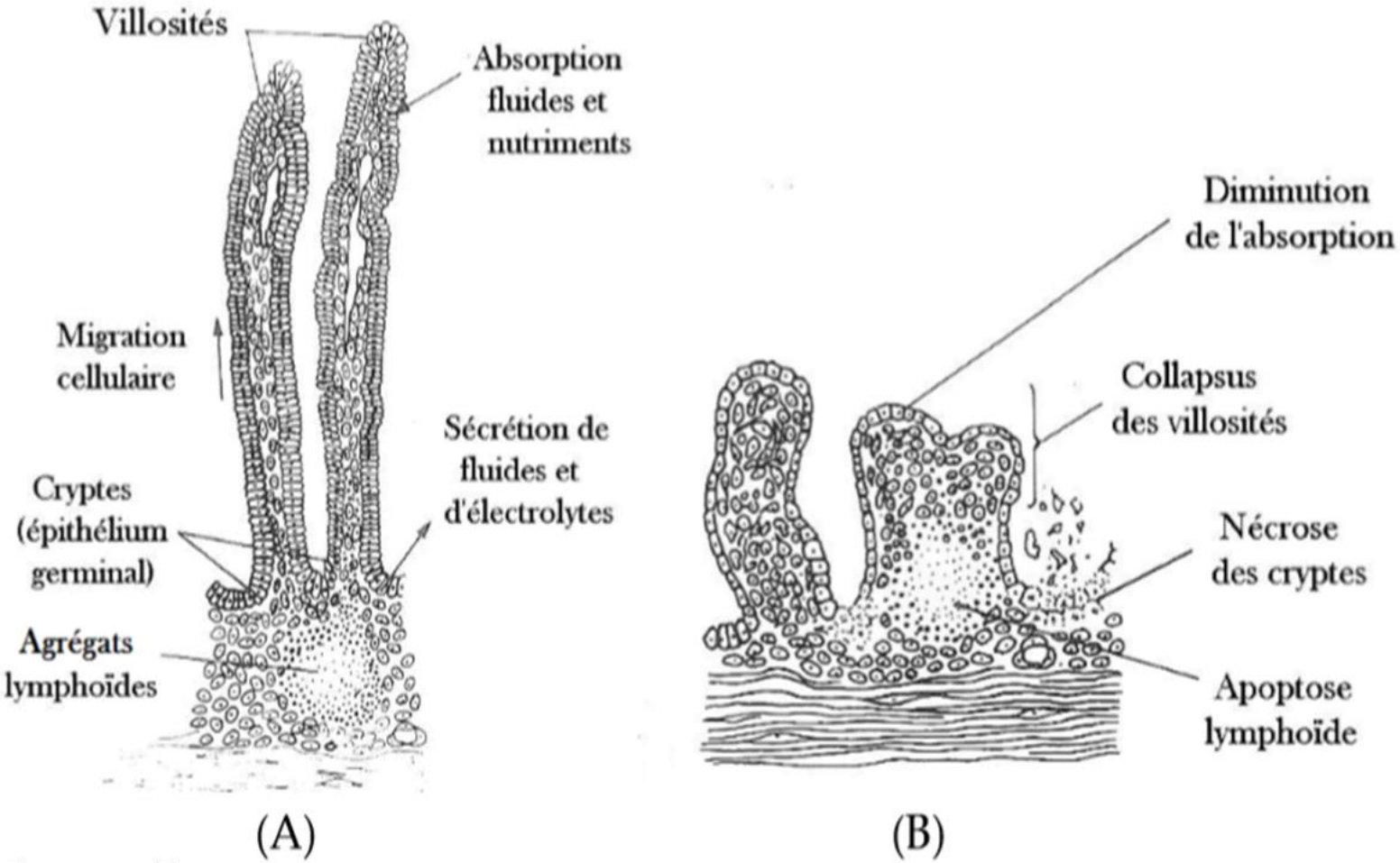


Intestinal tract of a 2-year-old intact female domestic longhair cat with severe feline panleukopenia. The intestinal loops are dilated and flaccid and discolored red to purple.

➢ Microscopically :

- Initial intestinal lesions sit on the epithelium of the crypts; the villi are secondarily affected.
- Medullary aplasia (characteristic element): Most of the formed elements disappear.

On observe un collapsus des villosités intestinales, une nécrose de l'épithélium



Fonctions et aspect d'une villosité intestinale normale (A) et d'une villosité avec infection par le FPV (B),

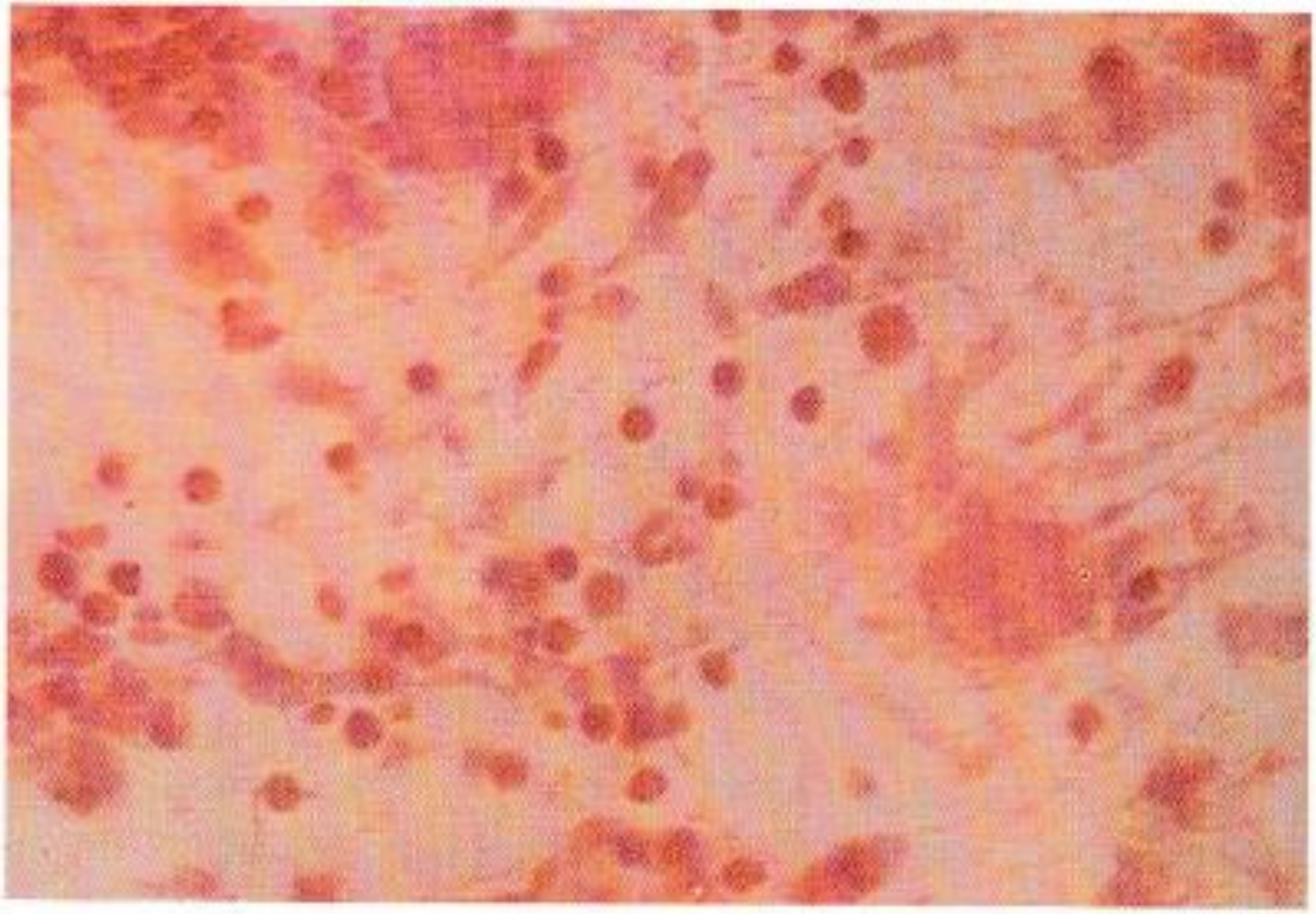


Photo 3 : Aspect typique de la mœlle osseuse montrant une déplétion cellulaire marquée (cliché ENVL)

Eosinophilic intranuclear inclusions appear from the 5th day and disappear between the 9th and the 11th day.

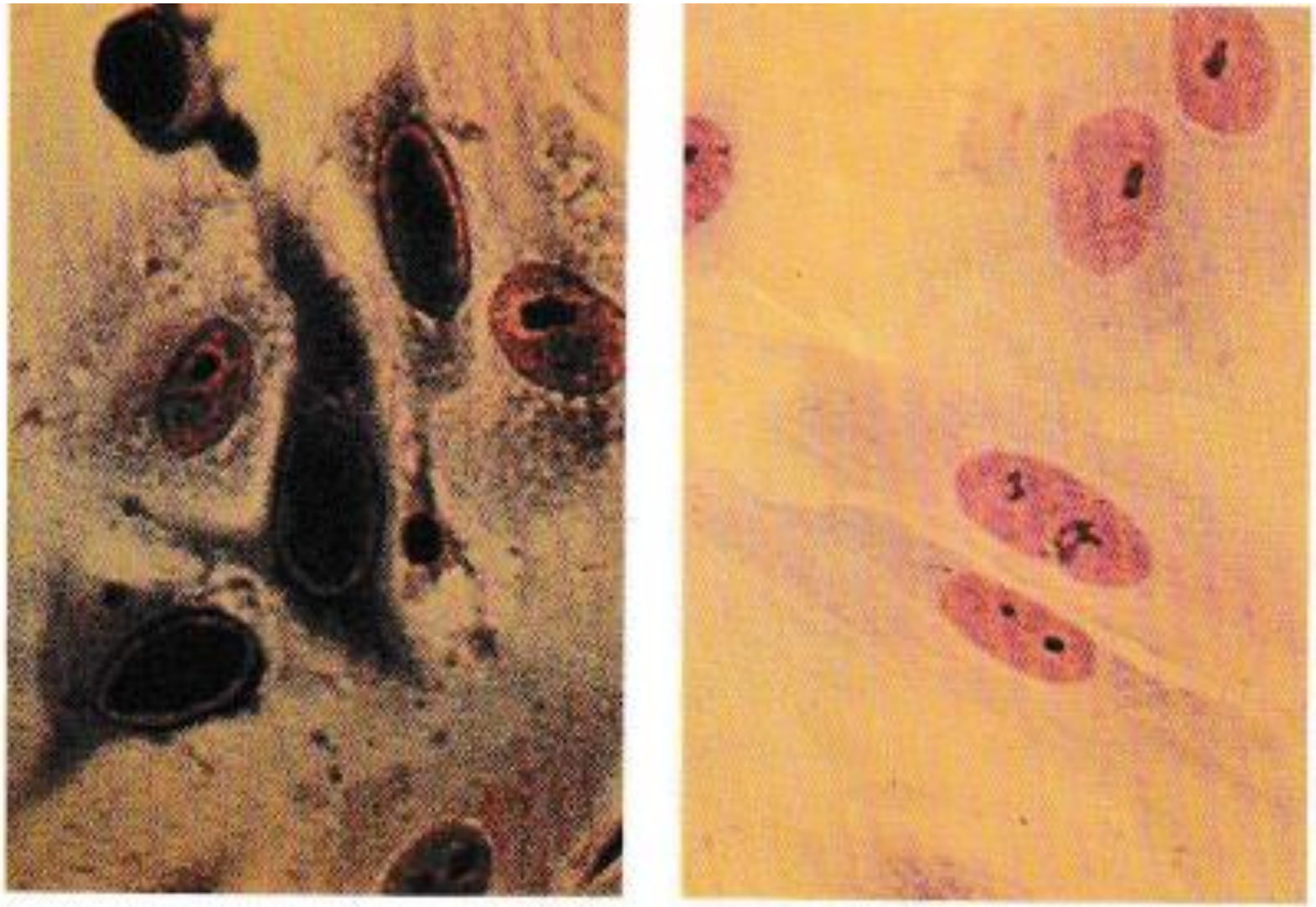


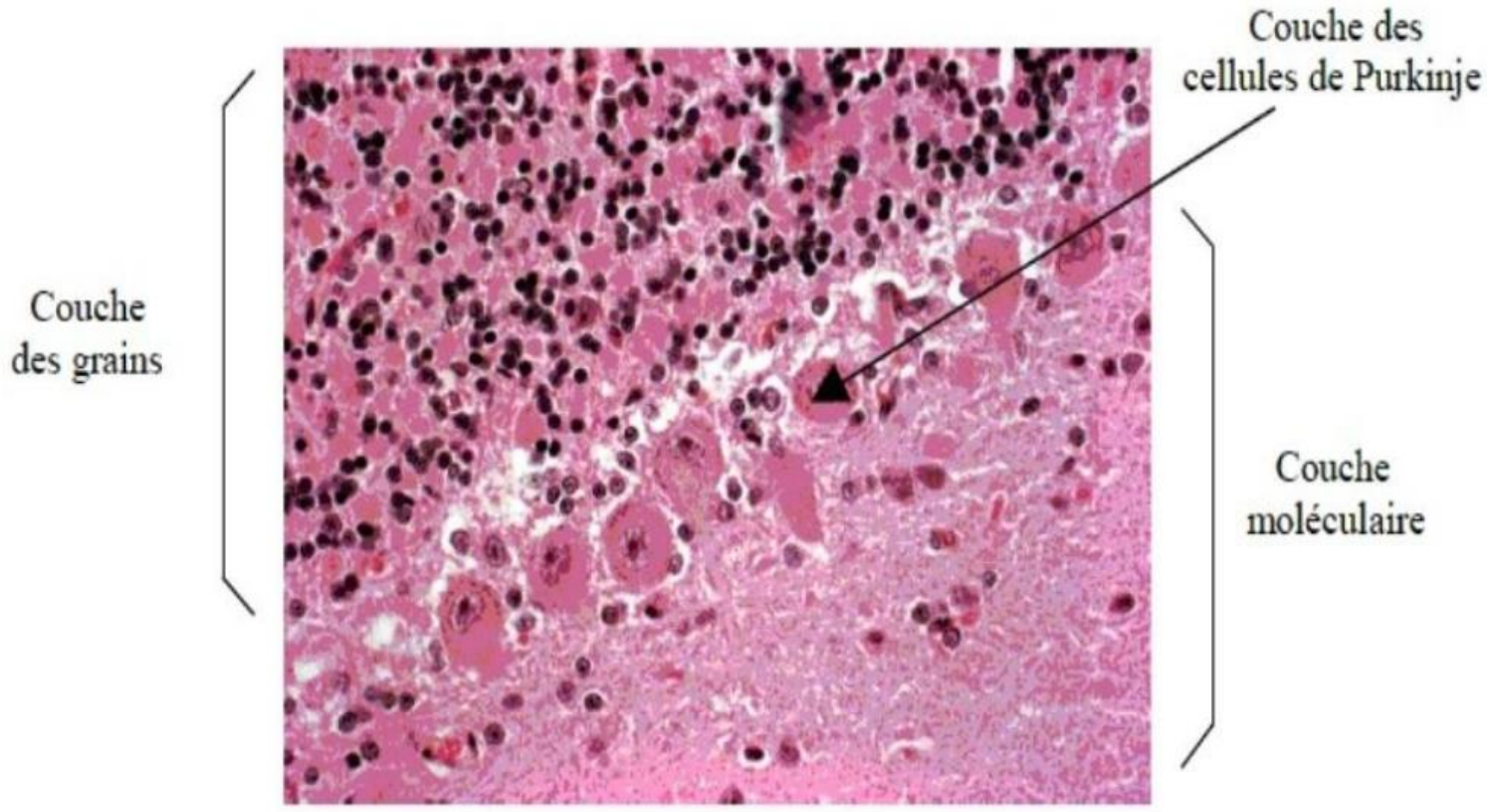
Photo 4 : À droite : lignée cellulaire saine ; à gauche : cellules infectées avec inclusions intra-nucléaires (cliché Chappuis).

❖**Nervous form**

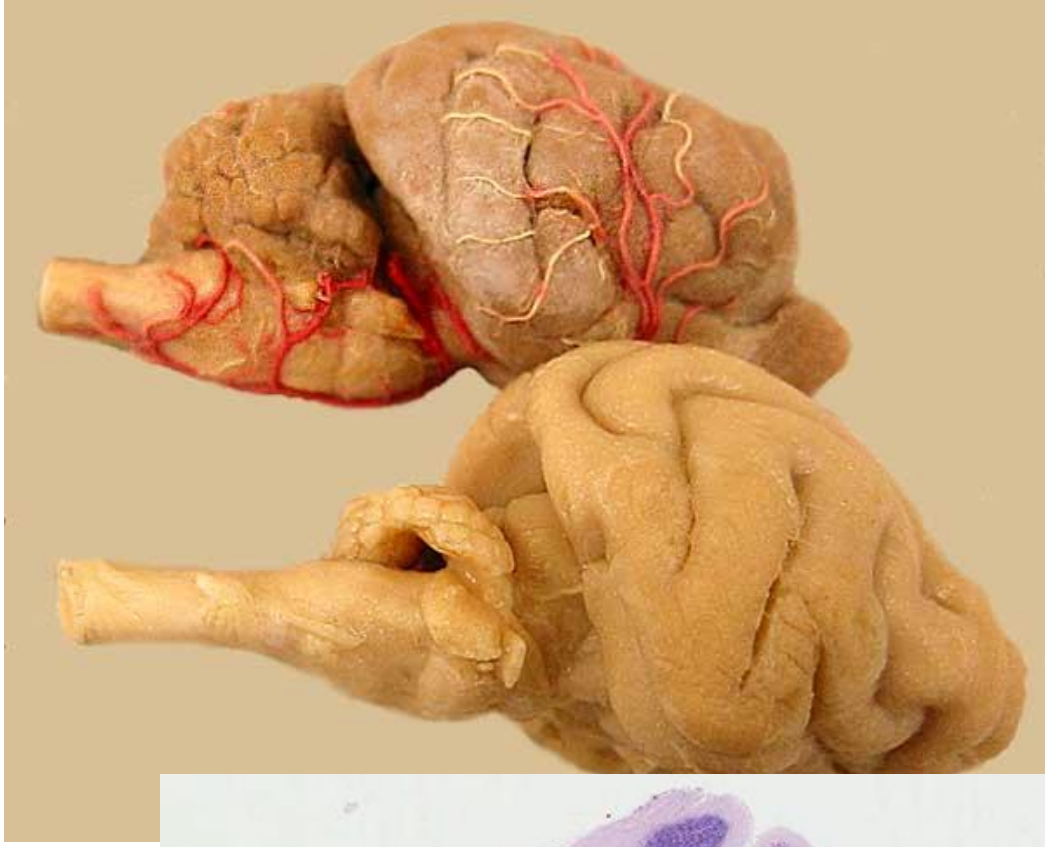
➢**At autopsy: Reduction in the volume of the cerebellum (the rest of the CNS is normal).**

➢ Histology :

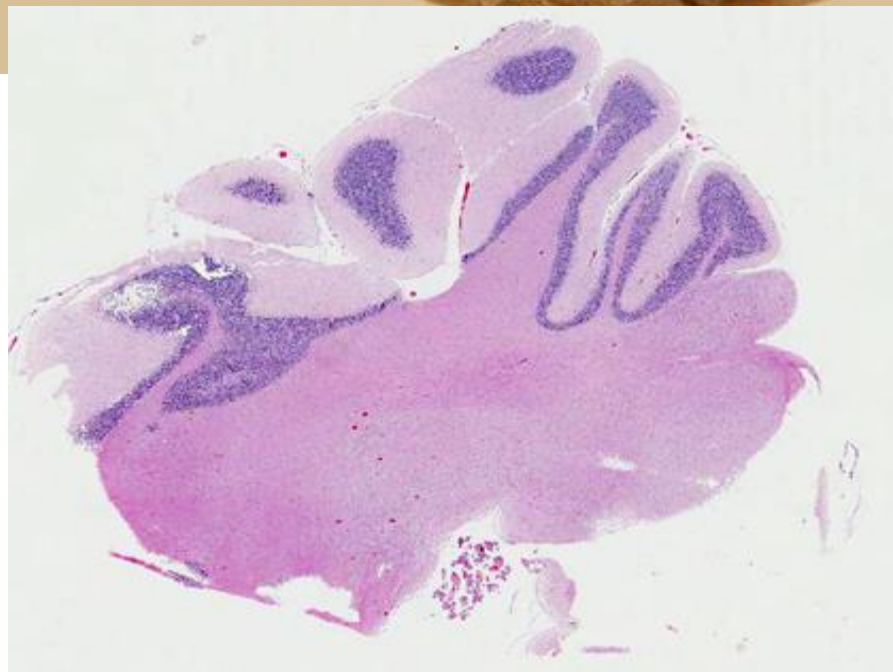
Cells of the 3 layers (from inner to outer: granular layer, Purkinje layer, molecular layer).



Two cat brains are shown in lateral view. The brain on top is normal. The brain below exhibits cerebellar hypoplasia, the result of an in utero viral infection.



The cerebellar leaflets are diffusely flattened.
The granular layer appears hypocellular = Rarity particularly visible on the granular layer.



Diagnosis

❑ Clinical

Kittens or young cats with hyperthermia, severe dehydration, vomiting with or without diarrhea.

These are generally kittens from groups and exposed to stressful circumstances.

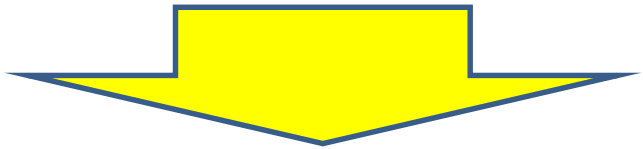
They may also be very young kittens showing signs of ataxia (with one or more kittens affected in the litter).

- Differential

- ✓ **Vomiting:**

- ➢ Linear foreign bodies = X-ray and/or an ultrasound.
- ➢ Intussusception: in kittens = observed on ultrasound.
- ➢ Intoxications due to the ingestion of irritating products or poisons.
- ➢ Gastric or duodenal ulcers.
- ✓ Viral enteritis caused by rotavirus or coronavirus: mildly pathogenic on their own; but may exacerbate digestive symptoms associated with FPV.

- ✓Bacterial diarrhea from Salmonella, Escherichia Coli, Campylobacter, Clostridium perfringens, or parasitic diarrhea.



May be associated with panleukopenia and worsen symptoms.

A coprological examination should be undertaken to exclude parasitic diarrhea.

- ✓ Action of the feline leukemia virus (Felv):
- ➢ May cause bone marrow aplasia predisposing to secondary superinfections, especially gram-negative ones, leading to a clinical picture resembling panleukopenia.
- ➢ Felv acts slowly; there is no reactive leukocytosis.

❑Para-clinical

➢Hematological modifications

Leukopenia is often present, mainly caused by neutropenia (bone marrow involvement) and lymphopenia (involvement of the lymphoid tissues).

The leukocyte count ranges from 100 /mm3 to 7000 /mm3.

The observation of leukopenia <4000 /mm3 with neutropenia can be considered characteristic when associated with the main symptoms.

Anemia may be present in cases of severe bone marrow involvement.

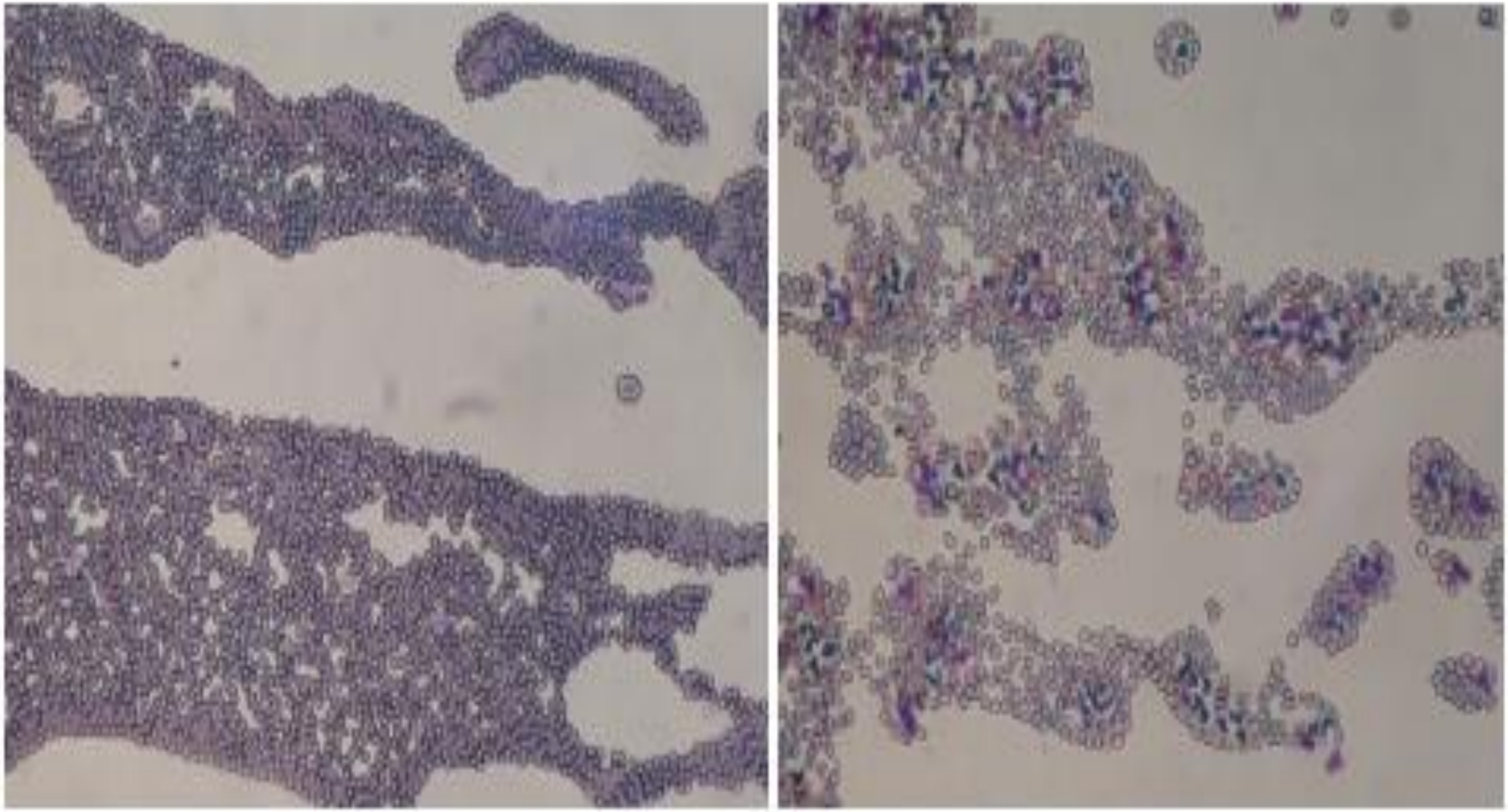


Photo de gauche : frottis sanguin d'un chat atteint de typhus : globules rouges et plaquettes, mais aucun globule blanc. Photo de droite : à titre de comparaison, frottis sanguin normal, avec d'assez nombreux globules blancs (colorés en bleu).

Prevalence of Laboratory Abnormalities in Cats with Panleukopenia

Leukopenia: 122/187 (65%)
Thrombocytopenia: 83/153 (54%)
Anemia: 91/187 (48%)
Neutropenia: 64/137 (47%)
Lymphopenia: 53/137 (39%)
Hypoalbuminemia: 45/101 (45%)
Hypochloremia: 40/112 (36%)
Hyponatremia: 41/127 (32%)
Hypoproteinemia: 46/153 (30%)
Hyperglycemia: 48/168 (29%)
Increased AST activity: 26/98 (27%)
Hyperkalemia: 30/132 (23%)
Increased BUN: 36/168 (21%)
Hyperbilirubinemia: 19/134 (14%)
Increased ALT activity: 18/135 (13%)
Increased creatinine: 12/155 (8%)
Hypokalemia: 9/132 (7%)
Hypernatremia: 8/127 (6%)
Hypoglycemia: 10/168 (6%)

➢ Biochemical modifications

Changes in biochemical parameters are generally non-specific:

- ✓ Increase in urea due to significant dehydration.
- ✓ Increase in liver parameters (Alkaline Phosphatase, Alanine Amino Transferase, bilirubin).
- ✓ Hypoglycemia and hypokalemia are common.

- The highlighting of intranuclear inclusions

Is not of great interest as they appear too late to be detected during an acute infection since death generally occurs around the 3rd or 4th day.

➢Serology

By seroneutralization, inhibition of hemagglutination. The search for specific antibodies in the serum is not really usable: many already have them thanks to:

- Vaccination.
- Following an unnoticed infection.

- Viral detection

By immunofluorescence.

➢ Rapid tests

SCREENVET PANLEUCOPENIA AG
Feline Parvovirus Antigen Rapid Test Cassette

FPV Antigen Cassette Rapid Test Cassette (Feces/Vomiting) is a lateral flow immunochromatographic test for the qualitative detection of Feline Panleukopenia Virus (FPV Ag) from cat feces or vomit.

Test SNAP Parvo : Rapid detection of canine parvovirus

- Polymerase Chain Reaction (PCR)

➢ Electron microscopy

Samples are feces or intestinal samples.

Electron microscopy relies on observing the size and morphology of the viral particles in the sample.

Diagnostic Assays Available for Feline Panleukopenia

Assay	Specimen Type	Target	Performance
Canine parvovirus fecal antigen ELISA	Feces	Parvoviral antigen	Sensitivity varies with the assay used and the timing of specimen collection. False negatives are common, but a positive result generally indicates infection.
Histopathology	Usually necropsy specimens, especially gastrointestinal tissues	Crypt necrosis with intranuclear inclusions; FPV antigen with IHC or IFA	Can be used for necropsy diagnosis.
Polymerase chain reaction (PCR)	Feces, tissue samples	FPV DNA	Sensitivity and specificity varies depending on assay design. The extent to which attenuated live vaccine virus can be detected after vaccination is not well understood. Because of the high sensitivity of some assays, the significance of a positive result may be difficult to interpret. False-negative results may occur as a result of inhibition of PCR by components of feces.
Fecal electron microscopy	Feces	Virus particles	Not widely available, turnaround time can be slow, and may be expensive. Requires the presence of large amounts of virus.
Virus isolation	Feces, tissues	FPV	Difficult, not widely available. Used primarily as a research tool.

FPV, feline panleukopenia virus; IFA, immunofluorescent antibody; IHC, immunohistochemistry.

Treatment

Early and appropriate treatment, along with daily nursing of the animal, are essential factors for successful treatment.

❑Symptomatic Treatment

✓Diet and refeeding.

✓Correcting dehydration.

✓Limiting clinical signs due to diarrhea and vomiting.

- **Diet and refeeding.**
  - Enteral feeding may be helpful but impractical in most field situations.
  - A water diet of 24-48 hours is necessary to allow the digestive system to rest (controlled vomiting).
  - Replace hydration with parenteral rehydration in case of vomiting.

- After cessation of vomiting = Consider feeding (slowly) with a syringe using Royal Canin Recovery Liquid® or another syringe-fed diet.
- The stomach capacity of a kitten is about 4 to 5 ml/100 g of body weight.
- B complex vitamins, glutamine: parenteral route.

- **Fluidotherapy and hydro-electrolytic balance**

Function of the dehydration state:

Persistence of skin fold, dryness of oral mucous membranes, sinking of the eyeballs, and pulse.

- An animal showing signs of hypovolemia requires an intravenous (IV) fluid bolus of 5 to 20 mL/kg (or more depending on clinical signs) administered over 10 to 15 minutes.
- The bolus may be repeated until cardiovascular parameters improve and hemodynamic stability is restored (up to 90 mL/kg IV in the first 1 to 2 hours)

Calculation of the fluid plan over 24 hours.

Correction de la déshydratation = mL/24 heures	Poids moyen (kg) x pourcentage de (%) la déshydratation x 10
Besoins d'entretien = mL/24 heures	• 60 à 75 ml/kg/jour pour les chats/petits chiens (2,5 à 3,1 ml/kg/h) • 40 à 50 ml/kg/jour pour les chiens de grande taille (1,7 à 2,1 ml/kg/h)
Correction des pertes hydriques (diarrhée, vomissements)	Repose sur le remplacement des quantités estimées de ces pertes.
Total (mL/24 heures) = Correction de la déshydratation + Besoins d'entretien+ pertes continues	

- A loss is generally considered:
  - 4 mL/kg for vomiting.
  - 12 mL/kg for diarrhea.

- Fluid therapy can be adjusted based on the electrolyte disorders highlighted by the ionogram.
- Crystalloids: NaCl 0.9%, Ringer Lactate, may be supplemented with potassium.
- Glucose if needed.

➢ Vascular filling

In severe cases with:

Shock state. Persistent hypoalbuminemia.

Colloids, plasma or blood transfusion, Albumin.

- Anti-emetics

The following molecules can be used:

Metoclopramide (central antiemetic) (Primperan)

- (IV) at 0.02 mg/kg/h or 1-2 mg/kg/day in infusion.
- (IM), (SC) and (PO) at 0.1 to 0.5 mg/kg three times a day.

Prifinium bromide (peripheral anti-emetic; anti-diarrheal action; antispasmodic) (PRIFINIAL Injectable Solution, PRIFINIAL Tablets for small dogs and cats).

- IV, IM, and SC at 1 mg/kg/day (that is 1 ml/7.5 kg).
- PO at 5 mg/kg/day.

- **Digestive dressings and cytoprotective agents**

- Kaolin-pectin (KAOPECTATE®):

3 to 5 ml BID (twice daily) PO.

Adsorption of bacterial toxins by kaolin and protection of the intestinal mucosa by pectin.

- Smectite (SMECTIVET®, 1 teaspoon/10kg BID PO, SMECTA®, 1 sachet/12kg BID PO): Adsorption of bacterial toxins, dressing.

- Aluminum hydroxide (PHOSPHALUVET®, 145 mg/kg TID three times a day): Fighting gastric pain due to inflammation; often associated with an antisecretory agent.

- Sucralfate (ULCAR®, 0.25-0.5 g TID PO): Cytoprotective effect

➢ **Gastric antisecretory**

- **Cimetidine (TAGAMET®Injectable, TAGAMET®Tablets 200 mg): IV at 10 mg/kg four times a day (QID = quater in die), or at 0.1 ml/kg three to four times a day (TID-QID).**

SC, IM, PO at 5-10 mg/kg TID-QID (or ¼-½ tablet/10kg).

- **Ranitidine (AZANTAC®Injectable, AZANTAC®Tablets 75 mg):**

IV, SC 0.5 mg/kg BID (or injectable 1 ml/15-25kg BID).

PO 1-2 mg/kg BID: or 1 tablet/40kg BID.

- **Omeprazole**

At a dosage of 0.5-1 mg/kg/day in a single dose.

➢ Antibiotic therapy

Broad-spectrum antibiotics are generally chosen, effective against gram-negative bacteria and anaerobic bacteria.

They should preferably be administered IV, IM, SC.

- Ampicillin (22 mg/kg IV, SC every 6–8 hours) + Enrofloxacin (5 mg/kg IV, SC every 24 hours)
- Cefovecin sodium (Convenia®) (8 mg/kg SC once) or Cefazolin (22 mg/kg IV, IM, SC every 12 hours) + Enrofloxacin (5 mg/kg IV, SC every 24 hours)
- Metronidazole (30 mg/kg PO every 24 hours) + Enrofloxacin (5 mg/kg IV, SC every 24 hours)
- Amoxicillin/clavulanate (13.75 mg/kg PO

- Aminoglycosides:

➢ Gentamicin:

In cases of septicemia of intestinal origin and severe lesions of the mucosa.

The high nephrotoxicity makes it not a first-line antibiotic.

Its use must be accompanied by appropriate fluid therapy.

It is used at a dosage of 2-4 mg/kg BID IV, IM, or SC (GENTACAT®).

❑ Etiological Treatment

➢ Serum

It is mainly used to prevent infection following exposure of unvaccinated cats to sick animals or contaminated premises.

Administered SC or intraperitoneally, it generally protects for: 2 to 4 weeks.

Example: Serocat (5ml/kg SC for 4 days (Its interest is debatable).

- **Feline interferon omega (VIRBAGEN) Not all cats recover.**

Sanitary prophylaxis

- **Hygiene measures**

Given the extreme contagiousness and severity of the disease, a kitten showing clinical signs of panleukopenia must be isolated, whether in a veterinary clinic or a community (catteries, breeding farms, shelters, etc.).

Individuals coming into contact with the sick animal must wear overshoes, gloves, and disposable gowns.

The equipment used must be disinfected after each use (bleach dilution 1/30), as well as the premises once the animal is cured.

Rule = Special cases of shelters

Places where the origin and vaccination status of the populations of cats received are unknown

=

Quarantine for 6 days (average incubation period of the disease) of a newly introduced animal must be systematically carried out.

- **Medical prophylaxis**
  - **Passive immunity**

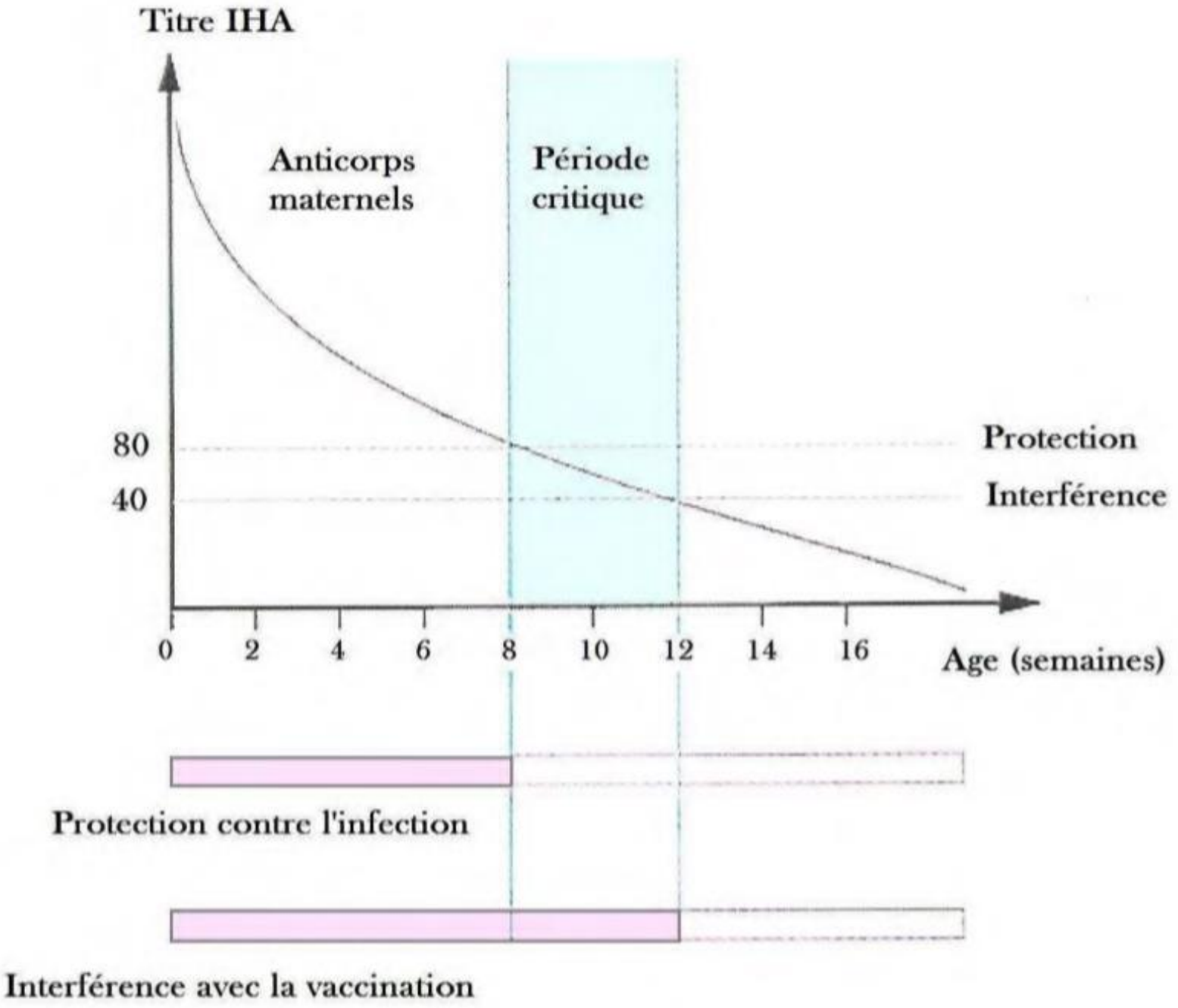
Transmission of maternal immunity

Passive immunity is primarily transmitted by colostrum (95%).

Absorption is important until the 8th hour after birth.

AOM levels in kittens decrease during the first weeks of life:

- ✓ Critical period between the 8th and the 12th week, during which the antibody level is too low to effectively protect the kitten, but high enough to interfere with vaccination (neutralization).


Titre IHA
Anticorps maternels
Période critique
80
40
Protection
Interférence
0
2
4
6
8
10
12
14
16
Age (semaines)
Protection contre l'infection
Interférence avec la vaccination

NB:

- Kittens that do not receive colostrum are susceptible to FPV infection from birth.
- Those who receive a low level of antibodies are susceptible to infection from 4 to 8 weeks.
- Those receiving a sufficient level of antibodies are susceptible from 12 to 16 weeks.

Anti-FPV serum

Anti-FPV serum can also be used:

In non-immunized adults to protect them in a risky situation.

Other at-risk situations: Kittens that did not receive colostrum.

- **Vaccination**

There are 2 main types of vaccines used in practice against feline panleukopenia:

- Attenuated live vaccines.
- Inactivated vaccines

Fabricant	Nom du vaccin	Valence	Type
Merial	Eurifel P	**FPV**	Vivant atténué
	Eurifel RCPFeLV	**FPV**, FHV, FCV, FeLV	Vivant atténué
Virbac	Feligen RCP	**FPV**, FHV, FCV	Vivant atténué
Pfizer	Felocell CVR	**FPV**, FHV, FCV	Vivant atténué
Fort Dodge	Fevaxyn iCHPChlam	**FPV**, FHV, FCV, Chlamydia	Inactivé avec adjuvant
	Fevaxyn Pentofel	**FPV**, FHV, FCV, FeLV, Chlamydia	Inactivé avec adjuvant
	Katavac CHP	**FPV**, FHV, FCV	Vivant atténué
	Katavac Eclipse	**FPV**, FHV, FCV, FeLV	Vivant atténué
Intervet UK Ltd	Nobivac Tricat	**FPV**, FHV, FCV	Vivant atténué
Schering-Plough	Quantum Cat CVRP	**FPV**, FHV, FCV	Vivant atténué

: Exemples de vaccins existant aujourd'hui contre la panleucopénie féline, d'après (26)

FPV : parvovirus félin ; **FHV** : herpesvirus félin ; **FCV** : calicivirus félin

Guidelines for Vaccination of Individual Pet Cats

Vaccine	Initial Vaccination		Booster Schedule	Comments
	Age ≤ 16 Weeks	Age > 16 Weeks		
FPV (A, SC; I, SC; A, IN)	6-8 weeks of age, then every 3-4 weeks until no sooner than 16 weeks (16-20 weeks in breeding catteries)[4]	Two doses, 3-4 weeks apart	1 year, then every 3 years thereafter	*Core.* Protection after the 12-month booster is strong and may be lifelong. Provides cross-protection to CPV2.[12] Do not give attenuated live vaccines to pregnant cats. Inactivated vaccines are for pregnant cats (if absolutely necessary) and cats with retrovirus infection. Inactivated and intranasal FPV vaccines should be avoided for routine vaccination in heavily contaminated environments such as shelters.

A, attenuated live; I, inactivated whole organism; IN, intranasal; SC, subcutaneous.

Guidelines for Vaccination of Cats in Shelter Environments

Vaccine	Initial Vaccination		Recommendations for Booster at Exit	Comments
	Age ≤ 16 Weeks	Age > 16 Weeks		
FPV (A, SC)	On entry and no earlier than 4-6 weeks of age, then every 2-3 weeks until no sooner than 16 weeks (up to 20 weeks when out-breaks occur)[4]	Two doses 3 weeks apart recommended, but one dose is considered protective	1 year, then every 3 years thereafter.	Potential to provide strong protection against FPV and CPV-2.[12] Administer alone or with SC vaccines for FHV-1 and FCV. Do not use in pregnant queens. The use of IN FPV vaccines is not recommended in shelters.

A, attenuated live; SC, subcutaneous.

FELIGEN® CRP:

Live attenuated feline calicivirus strain F9;
Live attenuated feline herpesvirus, strain F2;
Live attenuated feline parvovirus, strain LR

Public health aspects

- Although FPV is not known to infect humans, a unique strain was recently isolated from diarrheic monkeys in China.
- This strain has been shown to cause panleukopenia in vaccinated cats.