

الجمهورية الجزائرية الديمقراطية الشعبية

République Algérienne Démocratique et Populaire

وزارة التعليم العالي والبحث العلمي

Ministère de l'Enseignement Supérieur et de la Recherche Scientifique



جامعة الإخوة منتوري قسنطينة

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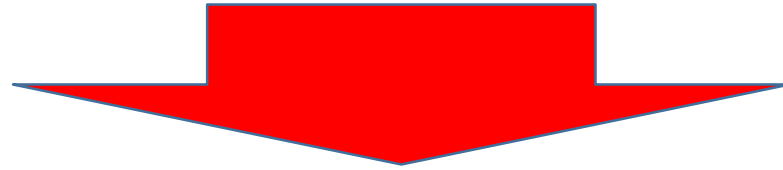
Institut des Sciences Vétérinaires

Feline leukemia virus infection (Feline Leukemia Virus Infection)

DrDjemai Samir

-Infectious, contagious, inoculable disease with a worldwide distribution that infects domestic cats and other feline species.

-Feline Leukemia Virus (FeLV) = Pathogenic Retrovirus



➔ Many diseases involving lymphoid tissues or hematopoietic and include tumors, particularly lymphomas and leukemias, as well as degenerative conditions, particularly of the bone marrow, resulting in anemia and immunodeficiency.

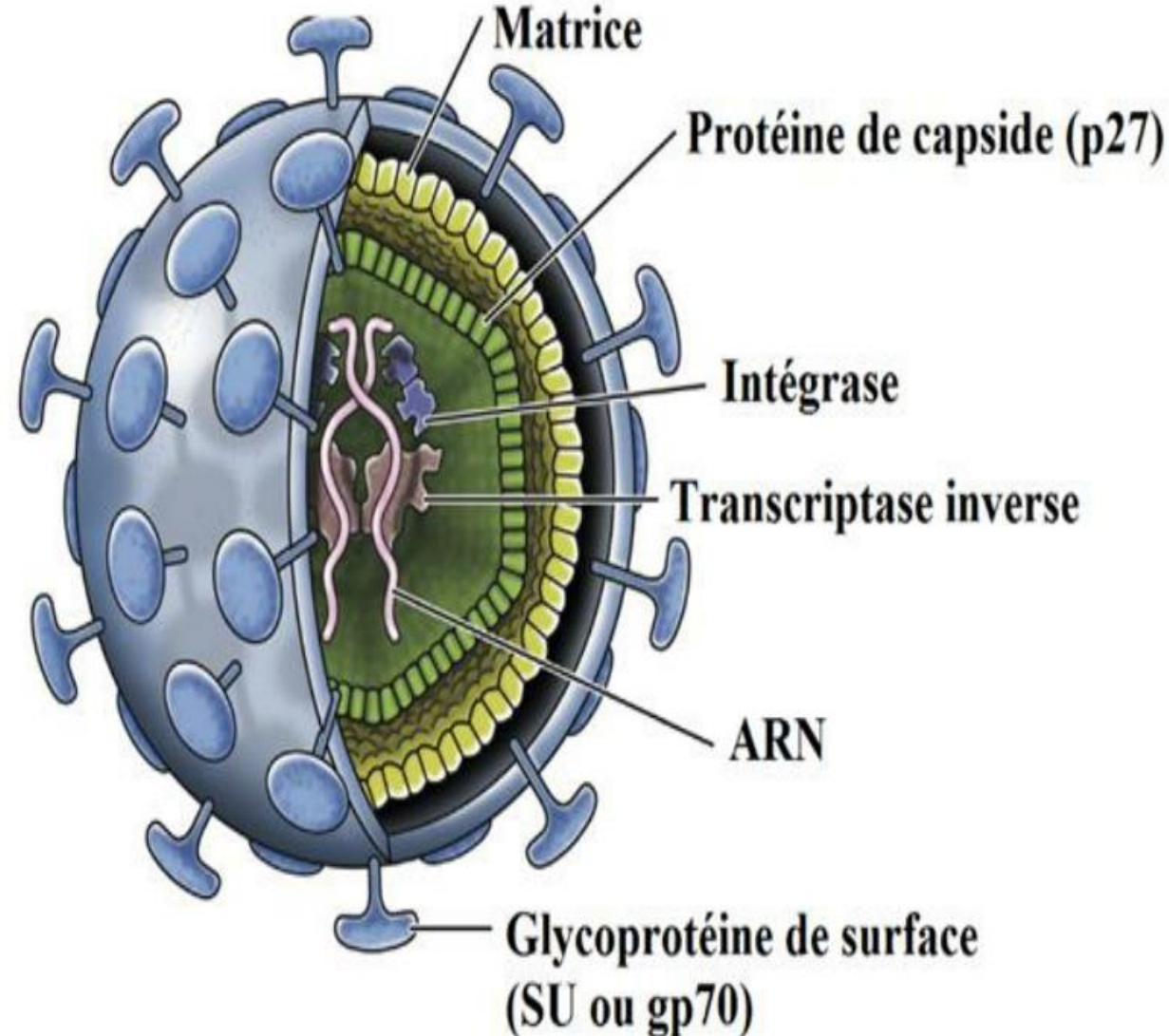
Etiology

-Feline leukemia virus (FeLV, Feline leukemia virus); belongs to the family Retroviridae, subfamily Orthoretrovirinae, genus Gammaretrovirus.

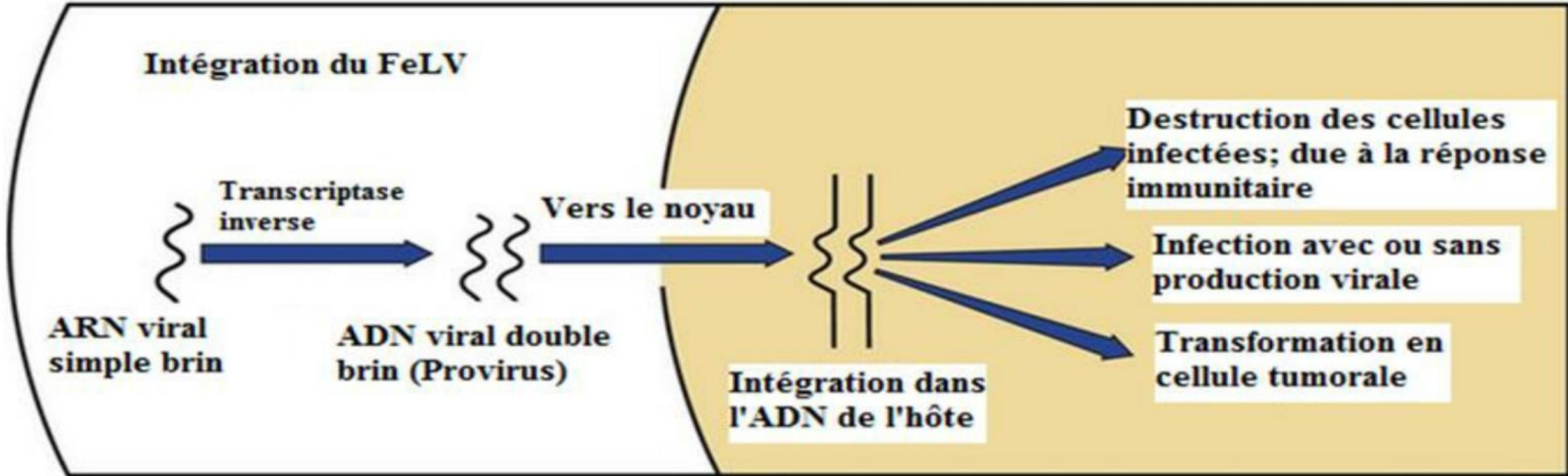
-Gammaretroviruses contain two identical strands of RNA and associated enzymes, which include reverse transcriptase, integrase, and protease.

- The whole thing is surrounded by the capsid and a surrounding matrix.

-The envelope, derived from the host cell, contains a glycoprotein gp70 and the transmembrane protein p15E.



-The presence of an envelope makes this virus extremely labile in the environment (outside the organism):
rapidly inactivated; very sensitive to all disinfectants (soap for example) and to drying.



-Retroviruses are characterized by:

-Reverse transcriptase allows the synthesis of a double helix of DNA from viral RNA.

-Integrase which allows the integration of the DNA formed within the host cell.

-The single-stranded viral RNA comes into contact with the host cell, integrates into its genome (cellular DNA) = to form a "provirus".

-Exogenous (foreign and pathogenic) and endogenous (hereditary, non-) retroviruses (pathogens) are present in cats:

-Exogenous pathogens: Transmitted horizontally from cat to cat; The most important are FeLV, FIV, FeFV (Feline foamy virus or Feline syncytial virus; a very widespread but has low pathogenicity) and FeSV (Feline sarcoma virus).

-All cats carry endogenous viruses; non-pathogenic, but can exchange genetic information with exogenous retroviruses to produce other highly pathogenic retroviruses.

Four subtypes of FeLV (A, B, C, T) are described; they differ in terms of cellular tropism and pathogenesis:

FeLV-A:

Present in all cats infected with FeLV; mildly pathogenic; highly contagious; mild cytopathic effects.

Only subtype A is transmitted between animals; subgroups B and C are derived from mutations and recombinations of subtype A with host DNA (enFeLVs = endogenous feline leukemia virus).

FeLV-A involved in all FeLV infections (100%); generally associated with immunosuppression and other FeLV-associated diseases.

Viral replication and contagiousness.

FeLV-B:

- Recombination between subtype A and enFeLV; is not transmissible and non-replicable and occurs with subgroup A in 50% or more of cats with neoplastic disease (lymphoma).
- Also associated with other hematopoietic neoplasms.

FeLV-C

- Mutation of the "env" gene of FeLV-A; rare (1% of cats affected by FeLV).
- Aregenerative anemia and erythroid leukemia; non-replicative; non-contagious.

FeLV-T:

- Variant of subtype A; tropism for T lymphocytes.

- Immunosuppression of varying severity.

Note:

It should be noted that subtypes B and C require subtype A to cause an infection.

Epidemiology

-FeLV = worldwide distribution; can cause significant mortality in domestic cats due to its ability to cause a immunosuppression, bone marrow disorders, and cancers hematopoietic.

-FeLV also causes infections in wild felines: bobcat, Iberian lynx, panther, etc.



-Overall prevalence of FeLV infection has decreased in over the last few decades (in some countries) due to from increased diagnostic testing and vaccination;

For example, in North America the overall prevalence is:

-Around 13% in the early 1990s.

-7% during the year 2006.

- FeLV = Often transmitted via the oronasal route = close contact: salivary secretions (licking, mutual grooming and sharing of food and drinking water utensils), urine, nasal secretions, feces.
- Other transmission routes: Bites, blood transfusions, the lacteal (milk; verimic phase in females), the transplacental route and possibly fleas.
- Virus is excreted mainly in saliva, while low viral loads are also excreted in the urine and feces, and milk of the infected cat.

- Cats that have access to the outdoors; those living in groups (who are in contact with other cats) run an increased risk of FeLV infection.
- Similar to FIV, FeLV presents a management challenge for feline communities (shelters, breeding facilities, etc.) due to its transmissibility and guarded prognosis.
- Concomitant diseases (respiratory or oral diseases and abscesses) and FIV co-infections present an increased risk of clinical FeLV infection.

Cats seem to develop resistance with age: o

Young children (<1 year; particularly those under 4 months) have a higher risk of contracting the disease and showing progressive progression.

o Adult cats can be infected, especially when they are exposed to high viral loads or when immunocompromised.

o Some authors believe that intact males are more affected than females and neutered males.

Pathogenesis

-After infection, usually via the oronasal route following exposure constant in chronically excreting cats, the infection pattern includes 5 stages:

-**Stage 1:**Initial viral replication occurs in the cells (lymphocytes and macrophages) of oropharyngeal lymphoid tissues, particularly in the tonsils and pharyngeal lymph nodes.

-**Stage 2:**Infected cells (circulating B lymphocytes and macrophages) disseminate the virus into the bone marrow, lymphoid tissues, and intestines.

-Stage 3: Viral replication occurs in lymphoid tissues, intestinal crypt epithelial cells, and bone marrow precursor cells. Viral RNA is integrated into the chromosomal DNA of host cells as a provirus, producing proviral DNA that can be detected by PCR testing. The provirus remains within the cell for its lifetime, which constitutes the molecular basis for FeLV persistence in cats.

-Stage 4: Release of infected neutrophils and platelets from the bone marrow into the circulatory system (viremia).

-Stage 5: Infection of epithelial and glandular tissues, with subsequent excretion of virus in saliva, urine and feces.

- **Immunocompetent cats**

-**Abortive infection:**

- oOccurs in 2 to 30% of cases in immunocompetent cats developing an effective immune response (humoral and cell-mediated) = Arrest of viral progression at stage 2 or 3 (4 to 8 weeks PI); high titers of neutralizing antibodies; resistance to further exposure.

- oAlthough antibody tests may be positive, the virus cannot be detected using any antigen testing method.

- Immunocompromised cats

-Regressive infection (transient regressive viremia):

- 30 % et 40 % des chats présentent une virémie régressive transitoire d'une durée de 3 à 4 semaines, durant laquelle les chats infectés sont contagieux et sérologiquement positifs pour la protéine p27.
- Après cette période = bonne réponse immunitaire est développée et l'infection est contenue.
- Chats deviennent sérologiquement négatifs pour la protéine p27, toutefois, la technique PCR (ADN-PCR) permet de détecter la présence du provirus dans les lymphocytes et les monocytes sanguins.
- Bien que les chats n'éliminent pas complètement le virus, ils développent rarement une maladie clinique et excrètent rarement le virus.

-Progressive infection:

- o This is a progressive or persistent viremia (stage 4) and 5) usually developing 4 to 6 weeks after infection and can take up to 12 weeks.
- o Cats rapidly develop clinical signs of FeLV-related disease.
- o The progressive infection occurs once the virus has established in the bone marrow and that the host's immune system is unable to suppress viral replication and cell destruction.

-Focal or atypical infection:

- o Focal or atypical infections have been reported in studies in up to 10% of infected cats under experimental conditions.
- o Focal or atypical infections may also be rarely observed in natural infections, consisting of persistent atypical local viral replication (e.g., in the mammary glands, bladder, and eyes).
- o Cats with an atypical infection of their Mammary glands can transmit the virus to their kittens via milk.

Clinical study

The outcome of FeLV infection is extremely variable and depends on:

- Of the viral strain involved.

- Viral load.

- Factors that influence the host's immune response include age, genetics, co-infections, stress, and treatment with immunosuppressive drugs.

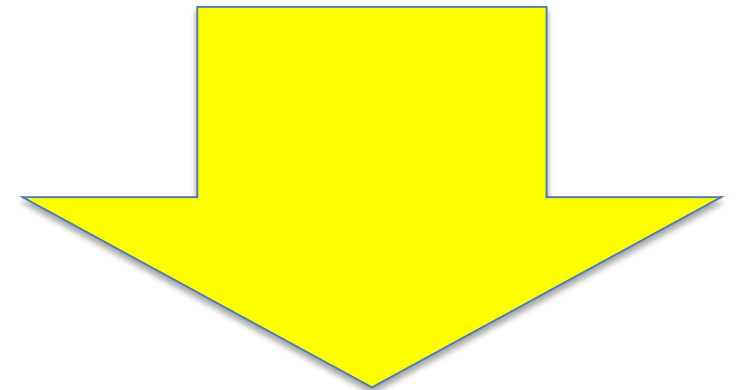
The clinical expression depends on the immune response to viral exposure:

- o Cats with progressive infections exhibit clinical signs and positive test results antigenic.

- o Regressive infections can persist throughout life and can be reactivated by immunosuppression.

Clinical signs in cats with

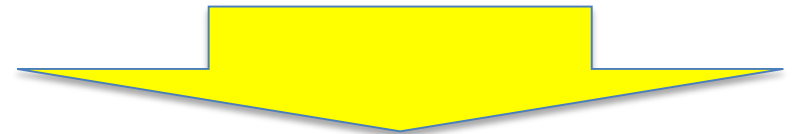
Progressive FeLV infection varies depending on the stage of the infection and secondary pathological processes and can involve any organ

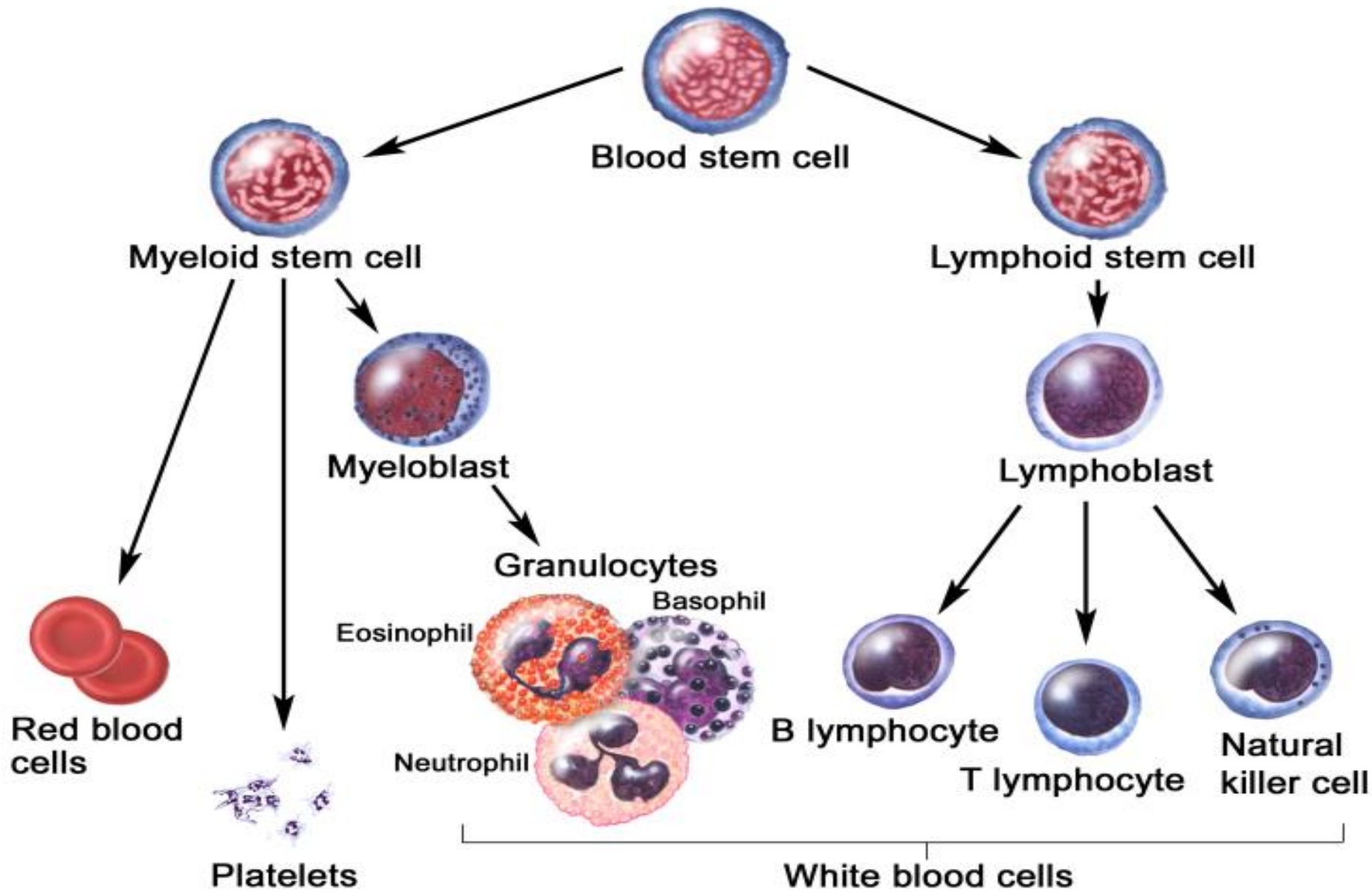


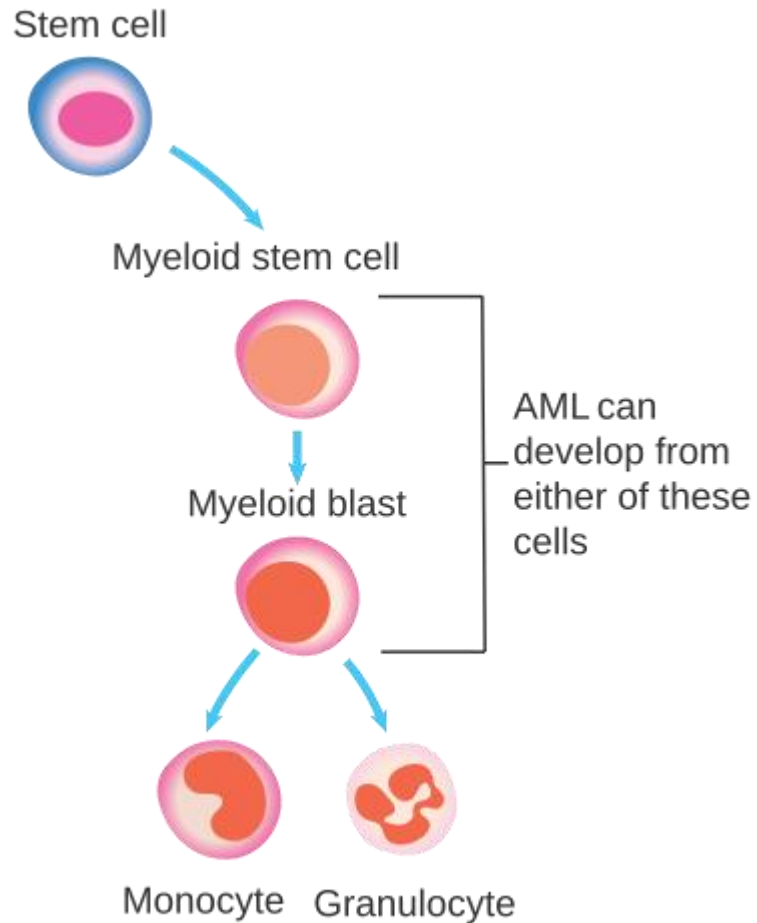
-Sick individuals may present with vague, nonspecific signs such as fever, lethargy, weight loss, lymphadenomegaly peripheral, stomatitis, subcutaneous abscesses and signs of upper respiratory tract (oculo-nasal discharge for example).

-Cats suffering from anemia (usually aregenerative anemia and Normochromic patients may present with pale mucous membranes, tachypnea, and tachycardia. Anemic murmurs may be audible on auscultation, and a Splenomegaly can be palpated.

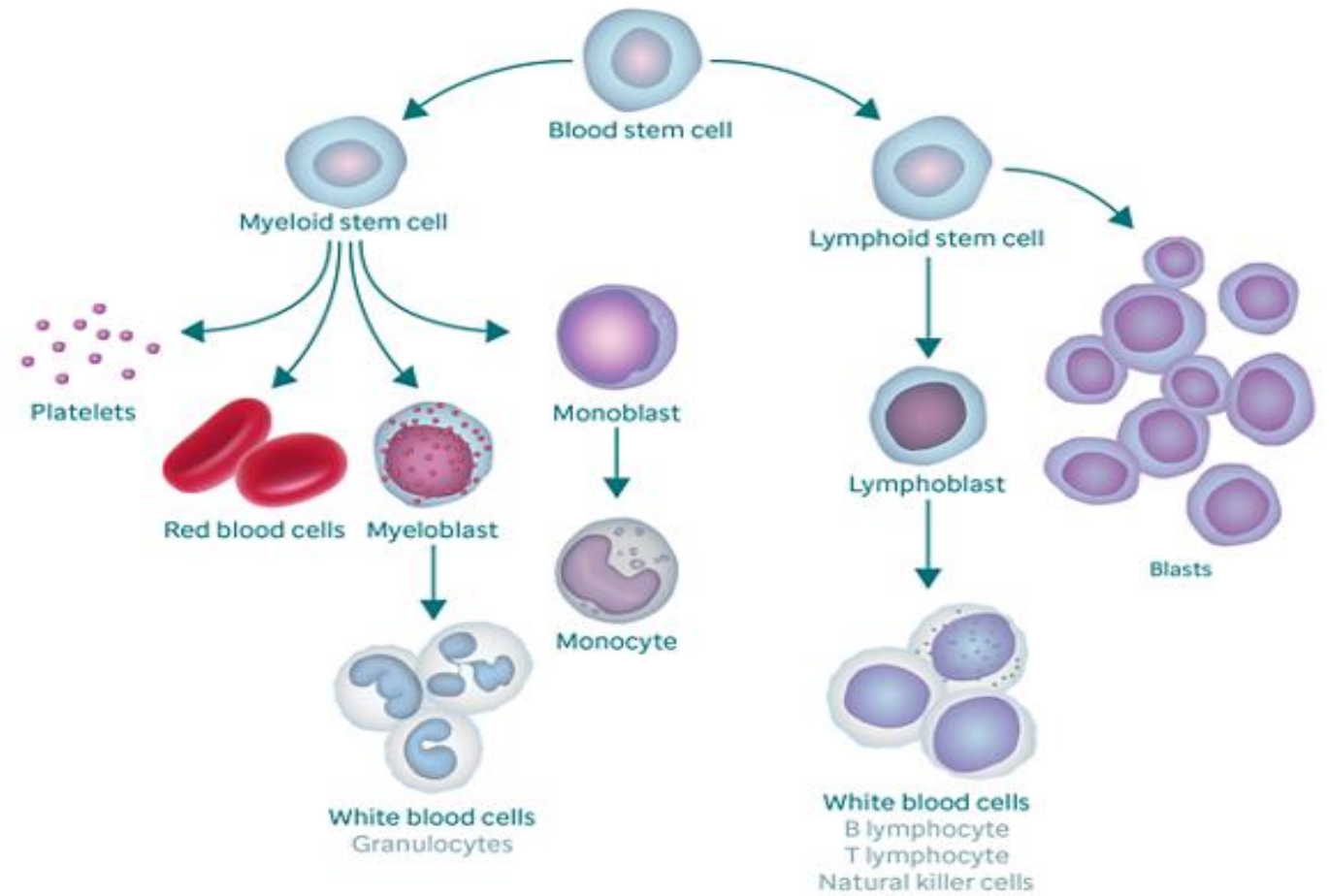
**-Cats infected with FeLV are at risk of developing tumors.
solid tumors (e.g., lymphoma) or leukemia**



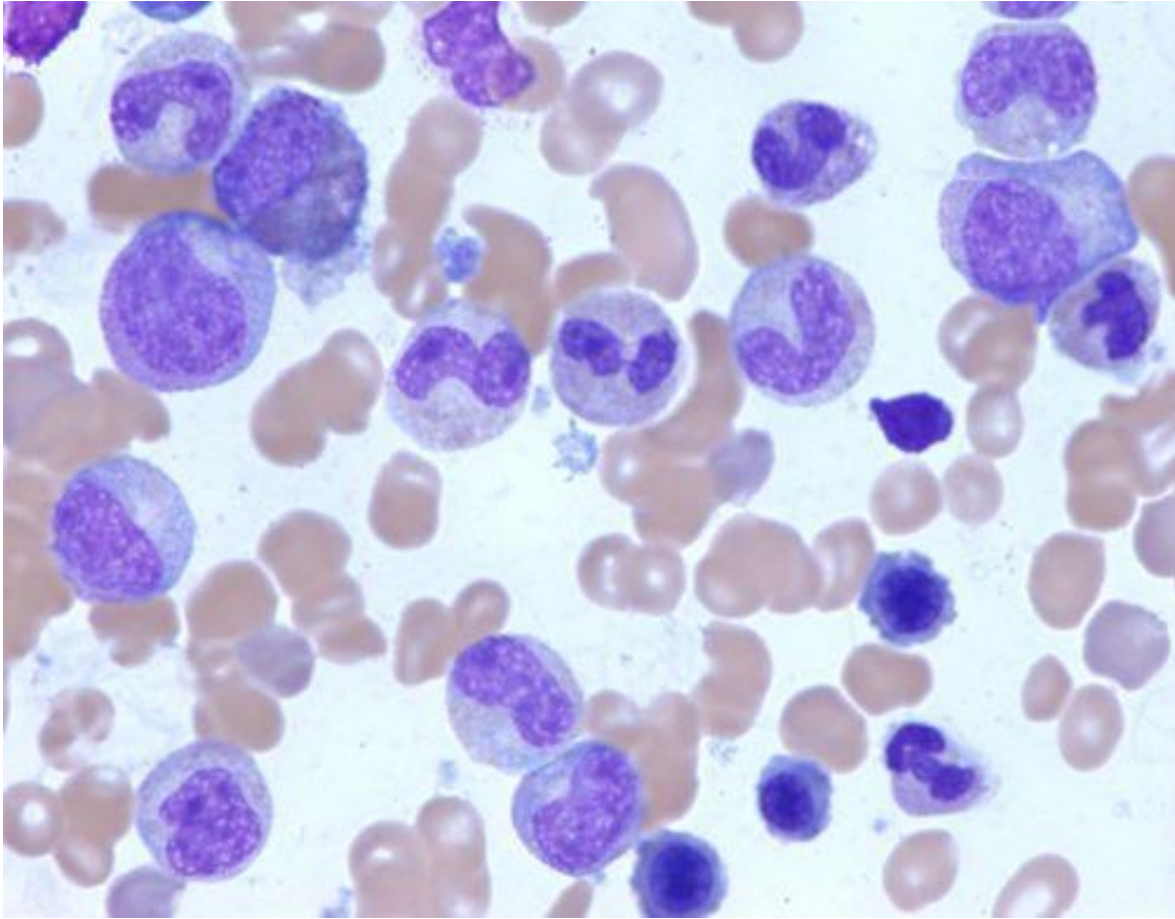




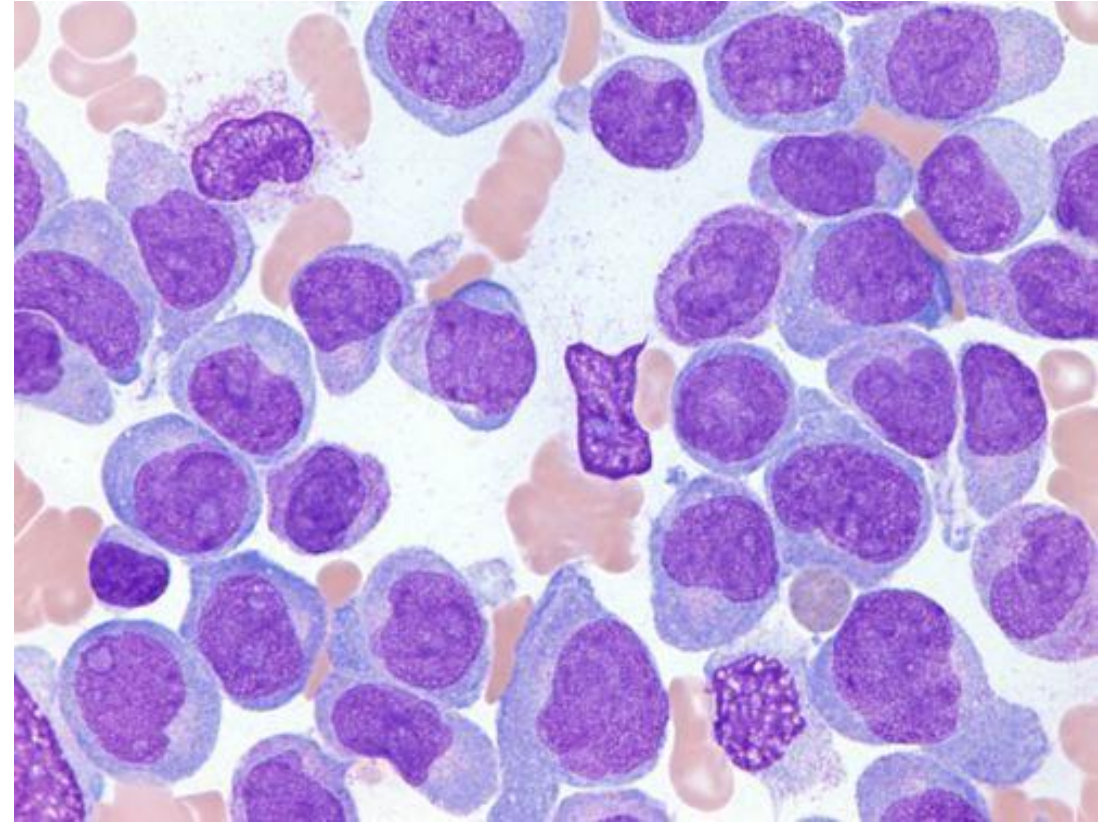
Acute Myeloid Leukemia (AML)



Acute lymphoblastic leukemia affects white blood cells called lymphocytes.



healthy bone marrow

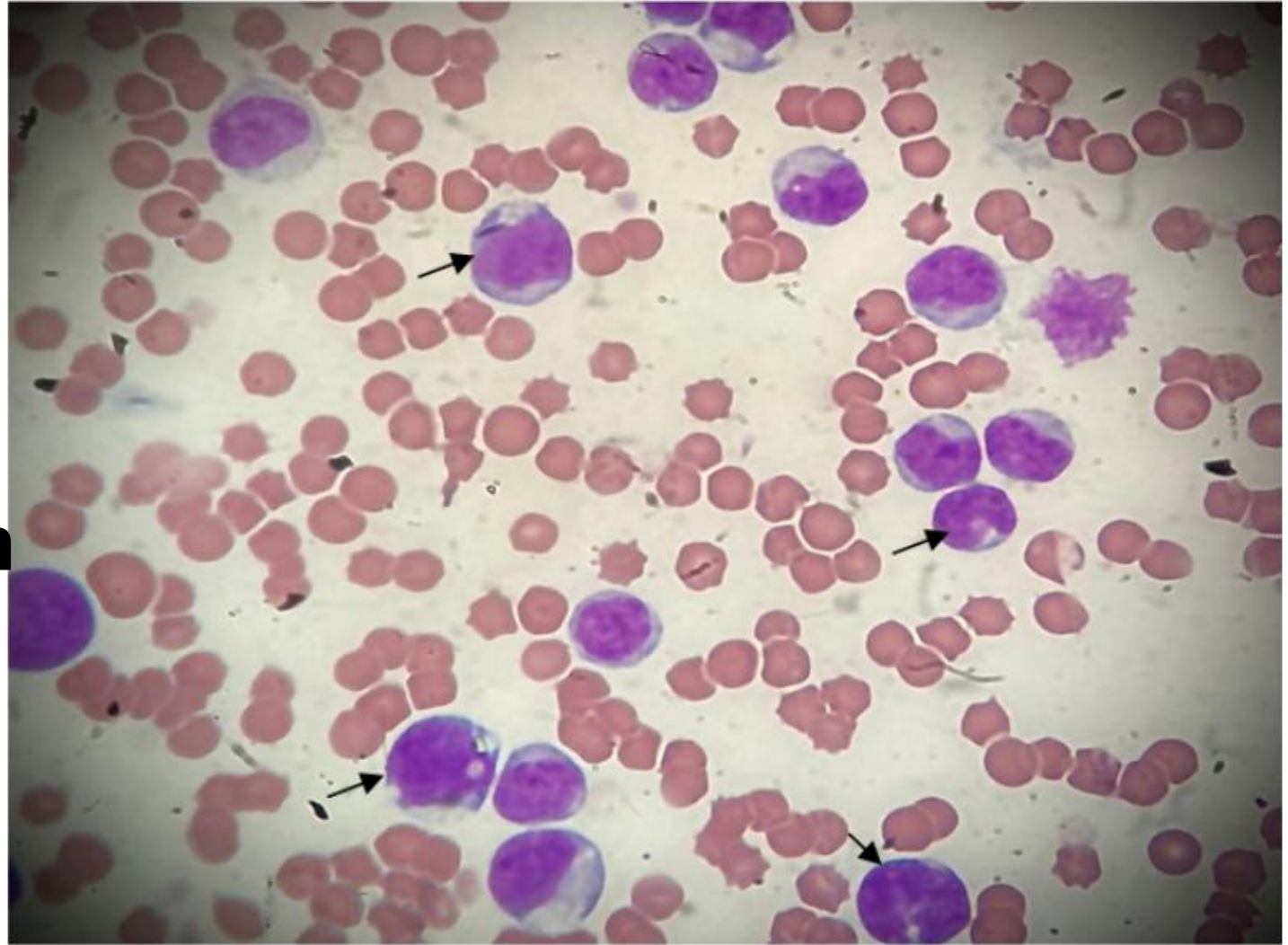


Bone marrow of an affected child
acute myeloid leukemia

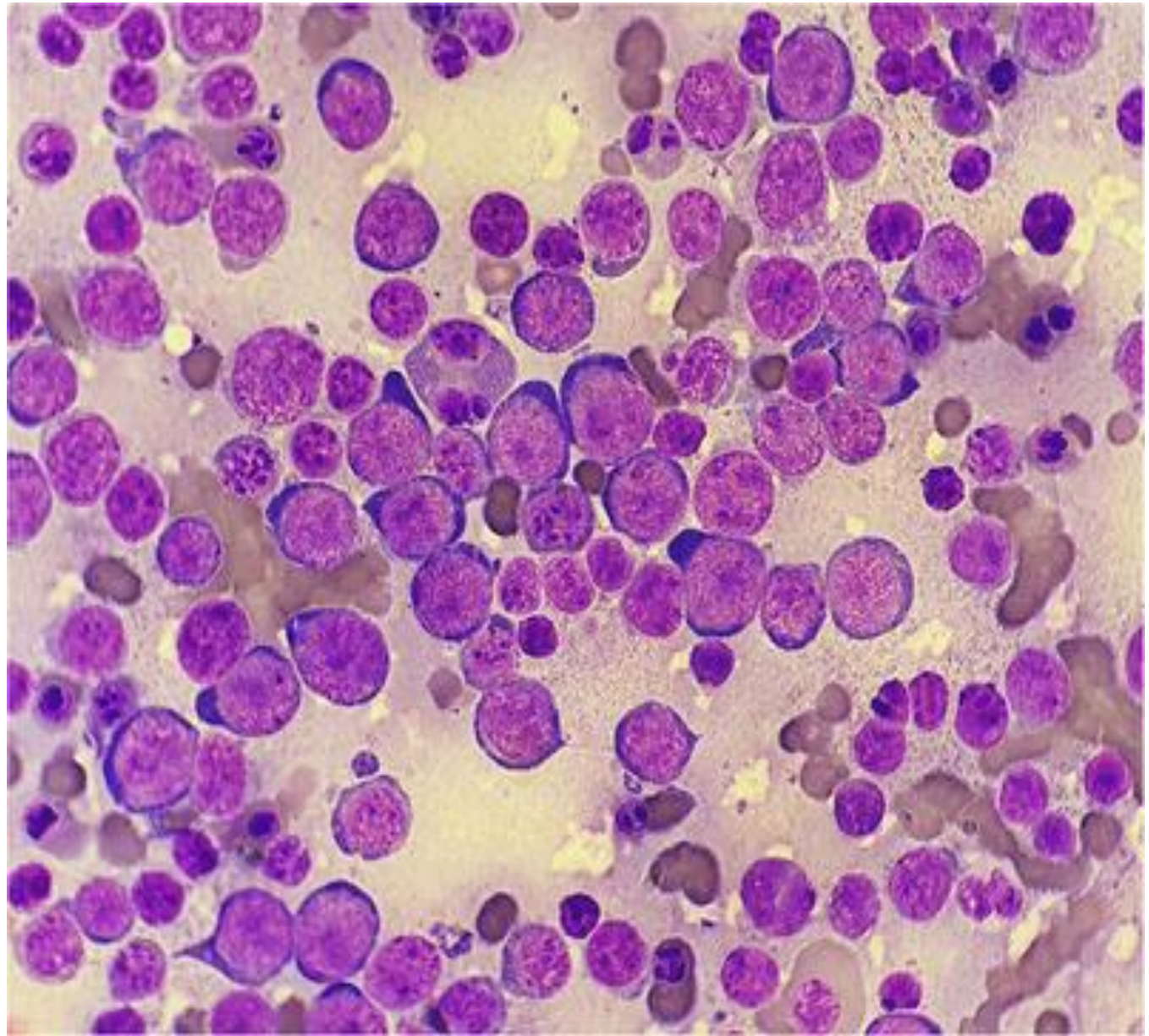
Pale mucous membranes/ 4-year-old male cat with FeLV (myeloid leukemia)



Peripheral blood smear from a feline with acute myeloid leukemia. High concentration of blast cells, morphologically indistinguishable from blast cells of lymphoid lineage (black arrows). Giemsa stain, 40x

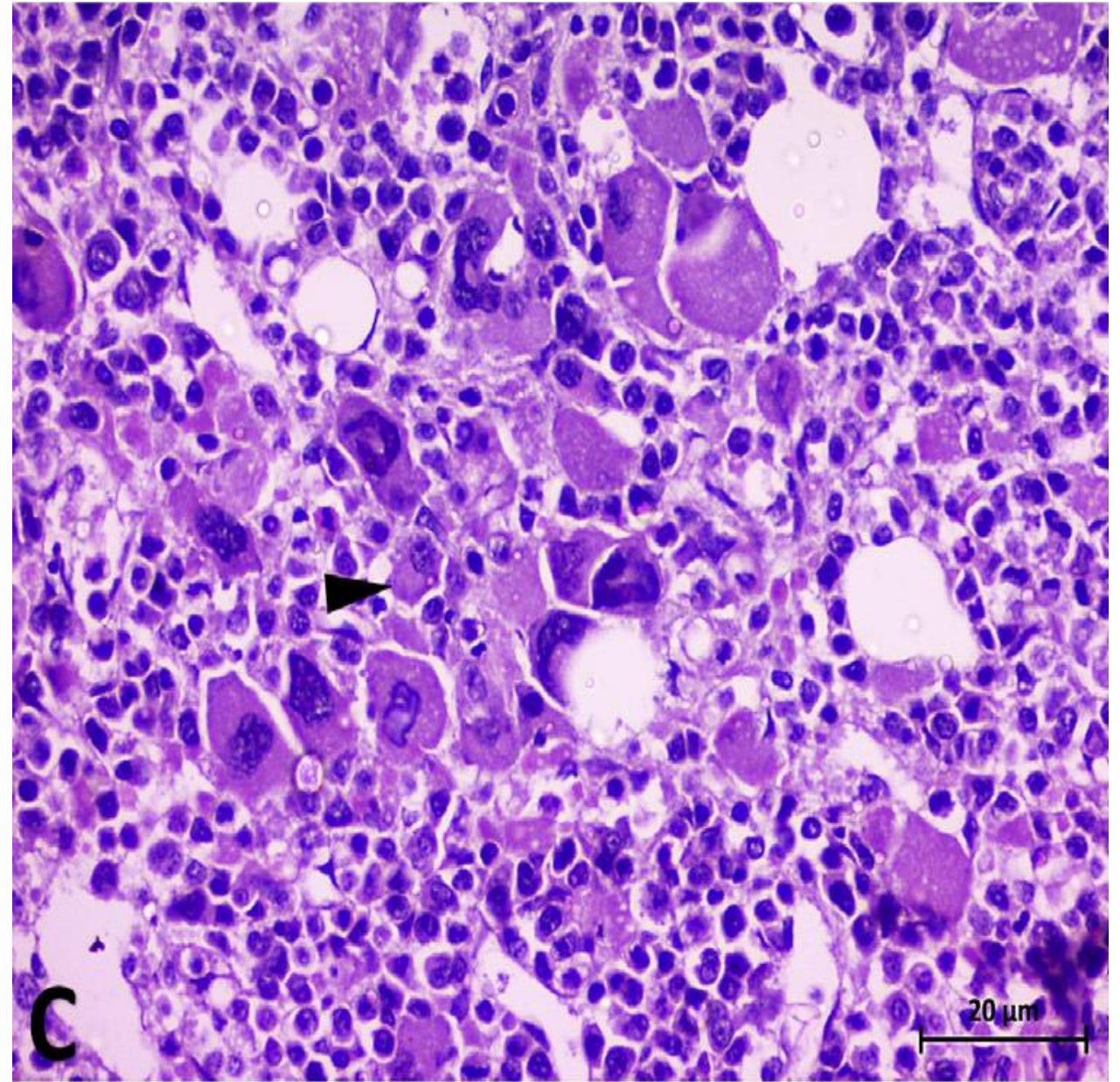


Bone marrow aspiration of a cat with erythroid leukaemia and FeLV infection. Cellularity was high, and most cells were erythroid precursors at varying ^{internships} of development (Diff-Quik, X100 objective).

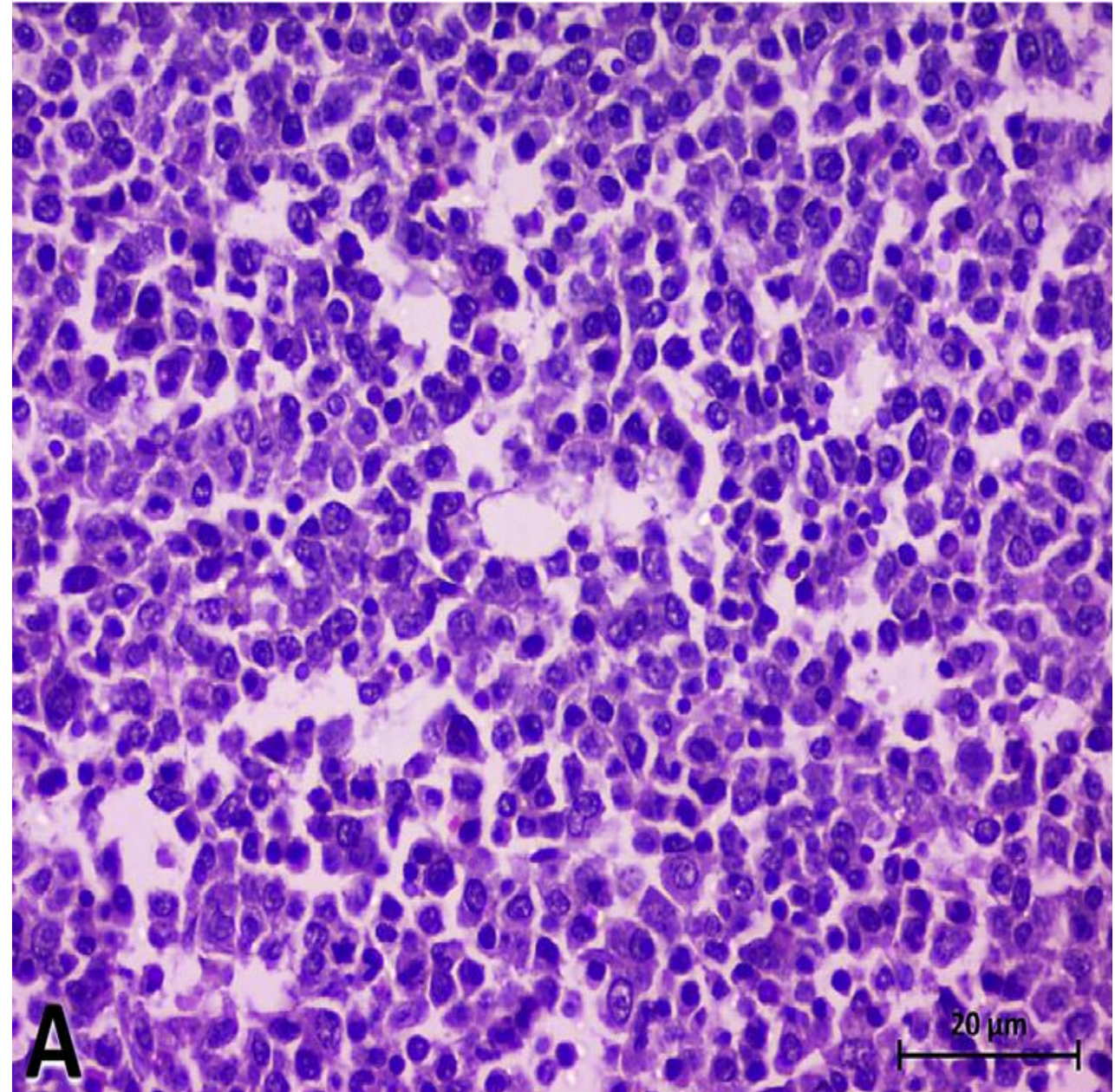


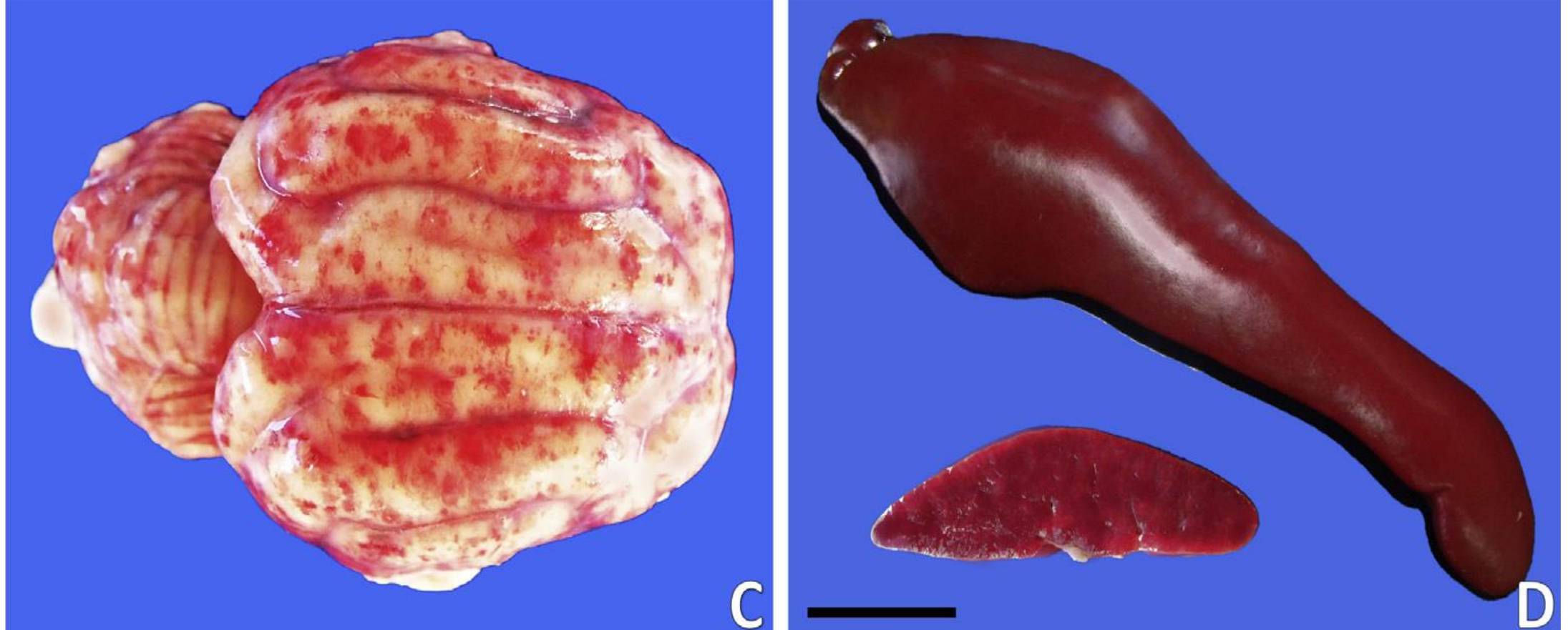
Acute myeloid leukemia
in a 6-year-old male cat/
FeLv.

There is an intense
proliferation of
megakaryocytes And of
micromegakaryocytes
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Large lymphocytes
neoplastics invade the
entire parenchyma
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marrow /FeLV
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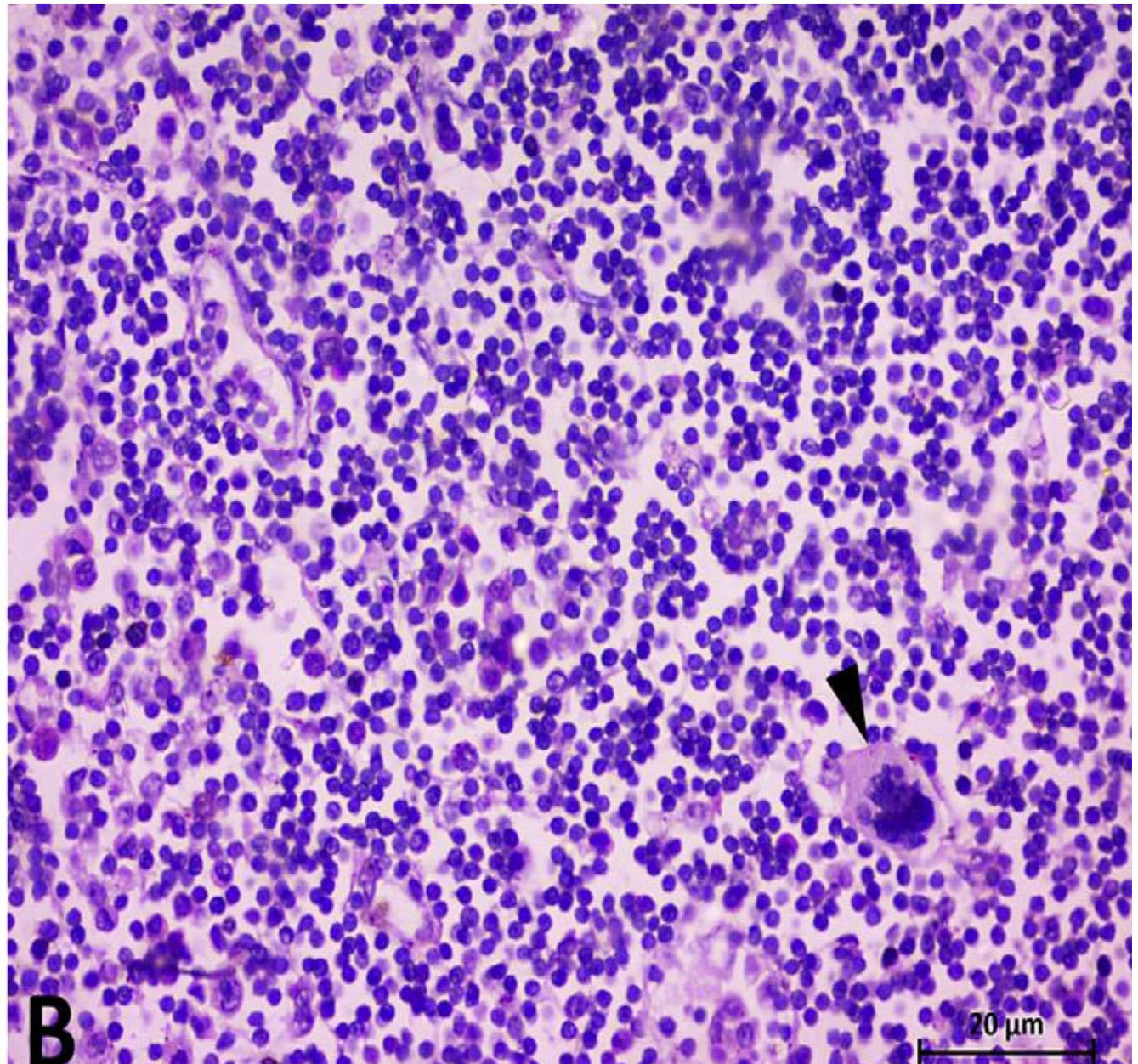
C: Meninges with multiple petechiae/ 4 year old female cat/FeLV (acute myeloid leukemia).

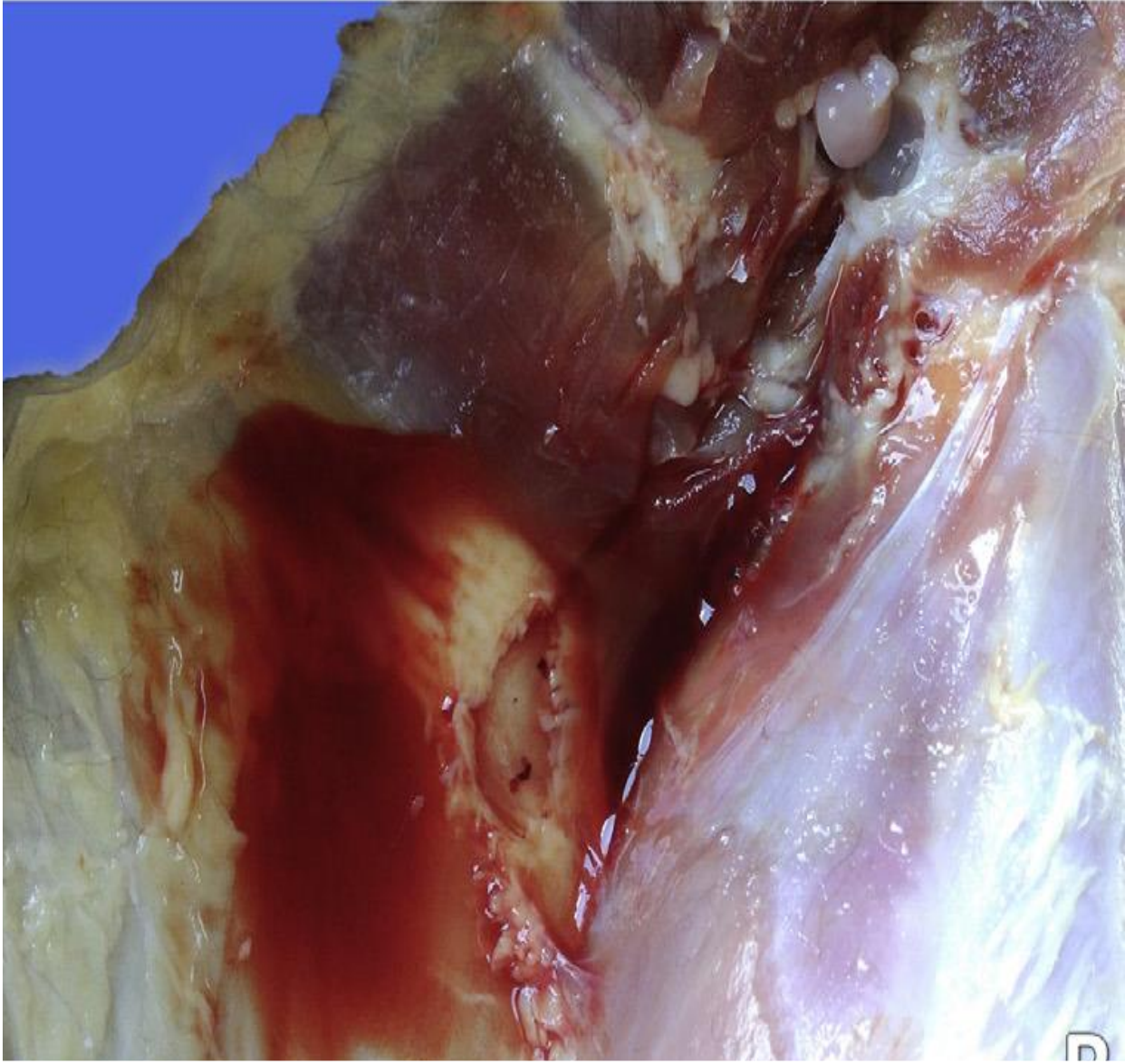
D: Acute splenomegaly / 1 year old female cat / FeLV. 2 cm bar (acute myeloid leukemia).



(E) Hepatic hypertrophy + diffuse hepatic pallor/ 5 year old male cat/FeLV (Chronic lymphocytic leukemia = myeloproliferative neoplasm = myeloproliferative syndrome = chronic cancer).

(F) Pale bone marrow/ 6 year old male cat/ FeLV (myeloproliferative neoplasm).

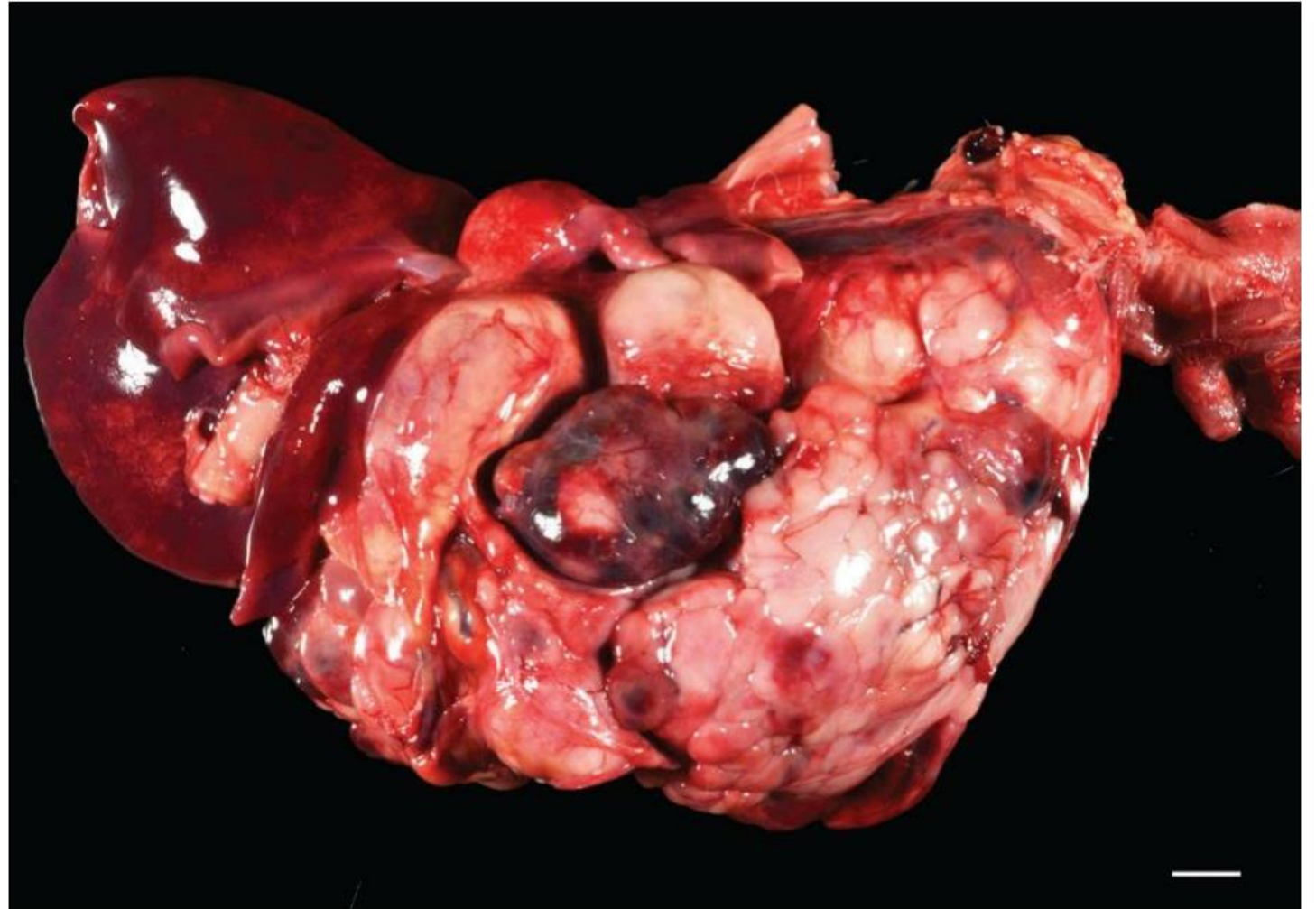




-In the case of thoracic neoplasia, a secondary pleural effusion manifests itself, reflected on auscultation by a decrease in lung sounds and a shift in heart sounds, and on palpation by a decrease in the compressibility of the cranial thorax.

-Lymphoma can cause a organomegaly abdominal (may be generalized) and lymphadenomegaly may be detected by palpation.

**Mass mediastinal
in a cat suffering
from lymphoma
associated with FeLV.**



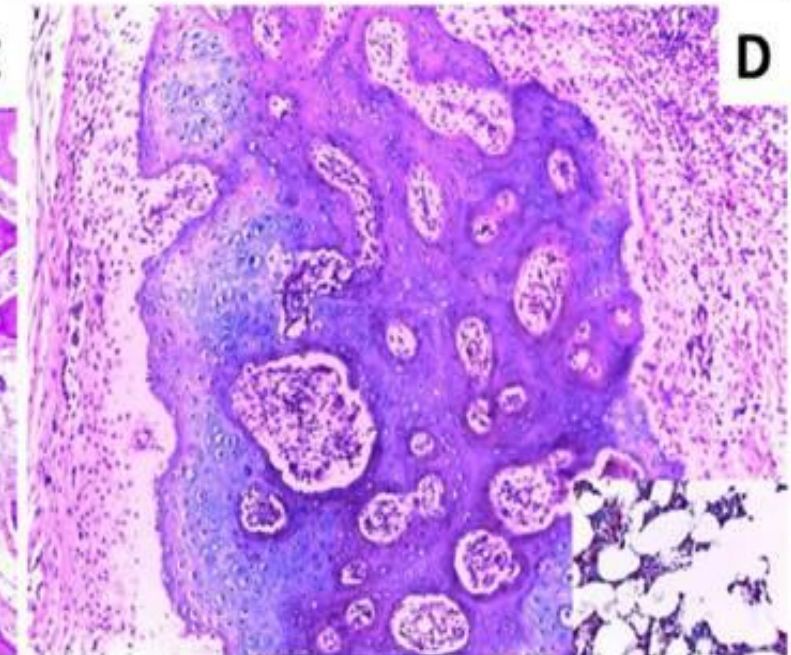
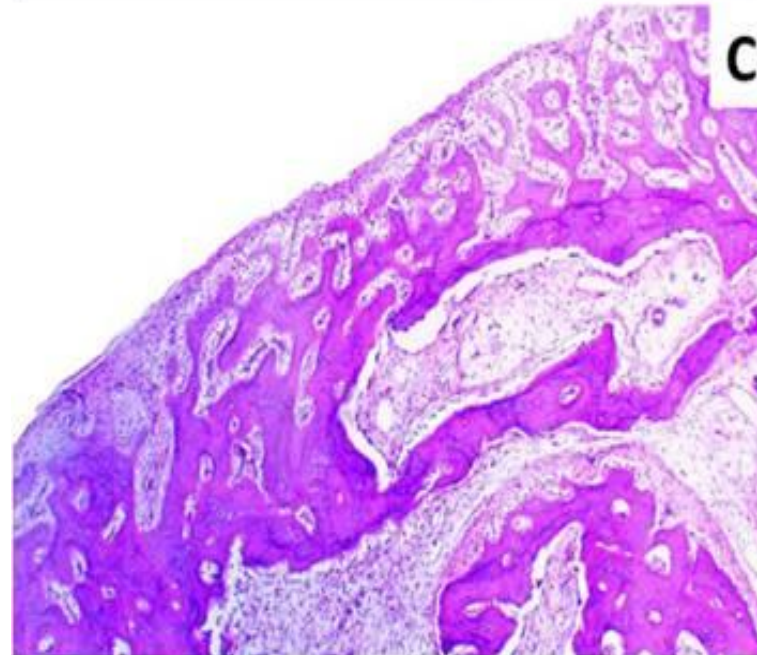
Osteochondroma of the humerus in a young cat infected by the **FeLV**.

(A) Increase in the volume of the distal humerus.

(B) Humeral section showing a bone proliferation covered with tissue whitish.

(C) Well-differentiated bone proliferation, coloration HE, 40x.

(D) Proliferated bone covered with tissue cartilaginous, HE hair color, 200x.

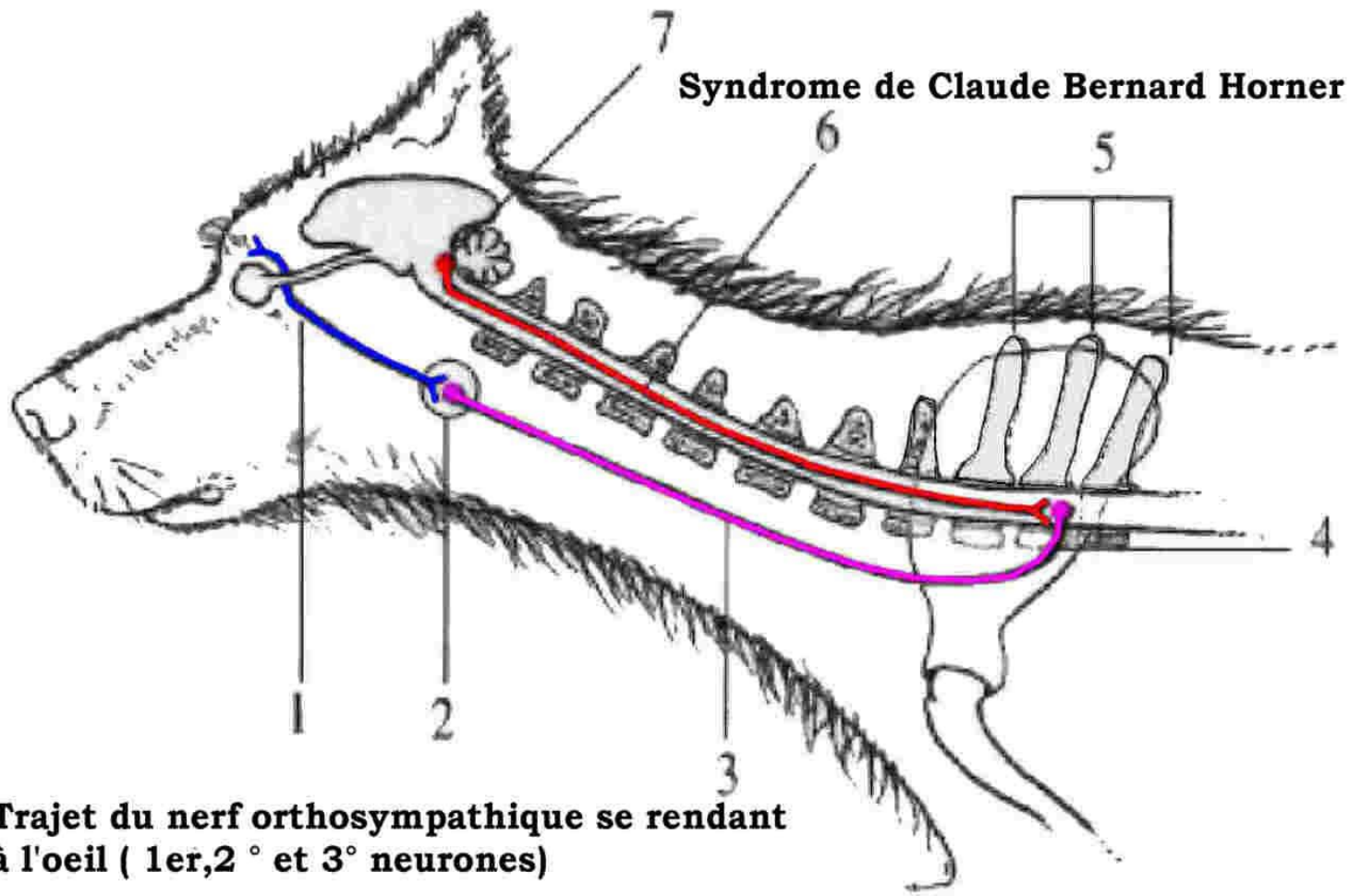


- Central and peripheral neurological signs such as anisocoria associated (or not) with Horner's syndrome, paresis, ataxia may also occur.
- Uveitis may also be present on physical examination, but it is often associated with ocular lymphoma or co-infections with other pathogens.
- Immunosuppression leads to increased susceptibility to bacterial, viral and/or fungal infections.
- Immune-mediated disorders can result in: Immune-mediated hemolytic anemia (IMHA), glomerulonephritis, polyarthrititis, etc.
- Reproductive disorders may also occur.

- Sterilized European cat, 6 years old, lives outdoors.
- A decline in performance has been noted for over a month.
- Anisocoria.
- Blood tests revealed the presence of anemia aregenerative.
- Positive for FeLV.



Claude Bernard Horner syndrome linked to FeLV



Trajet du nerf orthosympathique se rendant à l'oeil (1er,2 ° et 3° neurones)

1/ Troisième neurone; 2/ Ganglion cervical cranial; 3/deuxième neurone (tronc cervical sympathique); 4/rameau communicant; 5/ vertèbres thoraciques (T1,T2,T3); 6/ premier neurone; 7/ centre hypothalamique (modifié d'après CLERC [1])

ZONES DES ALTERATIONS POTENTIELLES DES STRUCTURES SYMPATHIQUES

Lateral chest X-ray. Note the presence of the mass in the dorsal lung field.



Chest X-ray (PA view): mass located on the right side.

Opportunistic infections in cats with progressive FeLV infection.

A. Nasal ulceration in a 6-month-old neutered male domestic cat with progressive FeLV infection as defined by positive ELISA and IFA assays in peripheral blood.

Stomatitis was also present, and feline calicivirus infection was suspected.

B. Severe nasal cryptococcosis in a Siamese cat from a cattery infected with FeLV.



Tableau. Résultats cliniques de l'infection progressive par le FeLV.

- Néoplasie, en particulier lymphome, leucémie et fibrosarcome (associé virus du sarcome félin)
- Infections opportunistes (Hémobartonellose, péritonite infectieuse féline, stomatite granulomateuse chronique, abcès, phlegmon)
- Maladie de la moelle osseuse
 - Aplasie pure des globules rouges
 - Anémie aplastique
 - Myélodysplasie
 - Myélofibrose
- Maladies à médiation immunitaire
 - Anémie hémolytique à médiation immunitaire
 - Thrombocytopénie
 - Glomérulonéphrite
 - Polyarthrite
 - Uvéite

- Signes neurologiques
 - Anisocorie
 - Incontinence urinaire
- Troubles de la reproduction
 - Avortement et infertilité les chattes infectées
 - Résorption foetale
- Fading kitten syndrome (**Isoérythrolyse néonatale féline**)
- Lymphome gastro-intestinal ou rénal
- Autre
 - Ostéochondromatose
 - Cornes cutanées

Diagnosis

Differential diagnosis

- Debilitating chronic illness, fever, weight loss should be tested for FeLV, regardless of age.
- Chronic upper respiratory tract infection, stomatitis, gingivitis and periodontitis, other common respiratory/oral signs that warrant antigen screening.
- Given that FeLV has oncogenic potential, cats with neoplasia, particularly lymphoid tumors, should be tested for FeLV.
- Hematological abnormalities: Non-regenerative anemia, lymphoblastic leukemia, leukopenia, thrombocytopenia or thrombocytosis (> 1 million platelets/mm³) may be associated with FeLV infection.

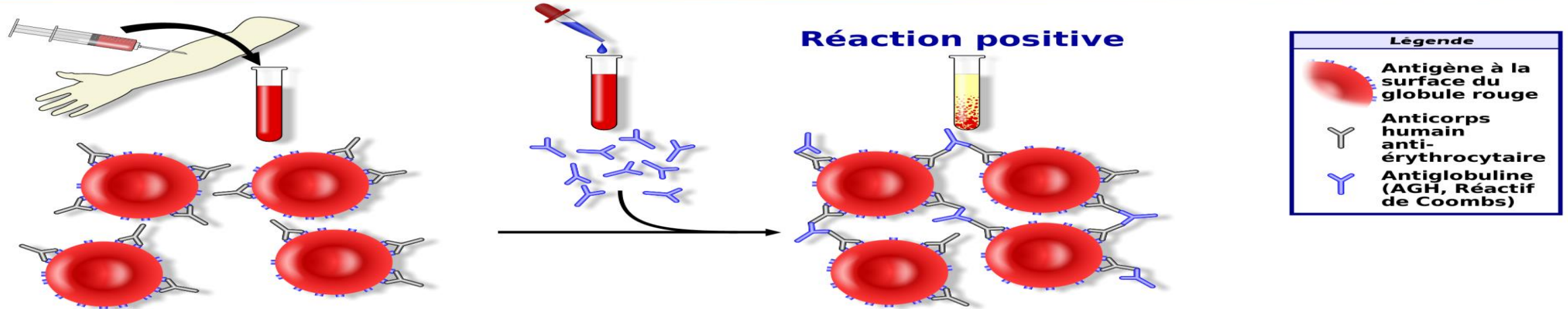
Paraclinical diagnosis

-Complete blood count

- May be normal or present: Non-regenerative or regenerative anemia, neutropenia, lymphopenia, monocytopenia and/or thrombocytopenia.
- Signs of agglutination may be present in cats with immune-mediated hemolytic anemia (Coombs test).

Moderate to marked leukocytosis and an increase in immature (non-segmented) neutrophils may also be present.

Test de Coombs direct / Test direct à l'antiglobuline



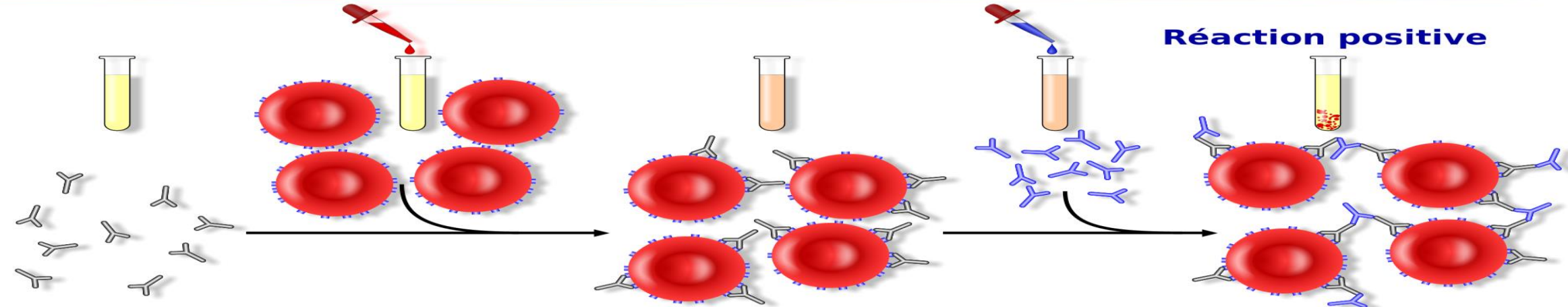
Globules rouges sensibilisés (GRS), chez un patient ayant une anémie hémolytique immunologique. Anticorps humains fixés aux antigènes des globules.

Ajout de l'antiglobuline aux GRS lavés.

Agglutination : Ponts formés par l'antiglobuline fixée aux anticorps humains.

Légende	
	Antigène à la surface du globule rouge
	Anticorps humain anti-érythrocytaire
	Antiglobuline (AGH, Réactif de Coombs)

Test de Coombs indirect / Test indirect à l'antiglobuline



Anticorps d'un sérum humain reconnaissant un antigène érythrocytaire.

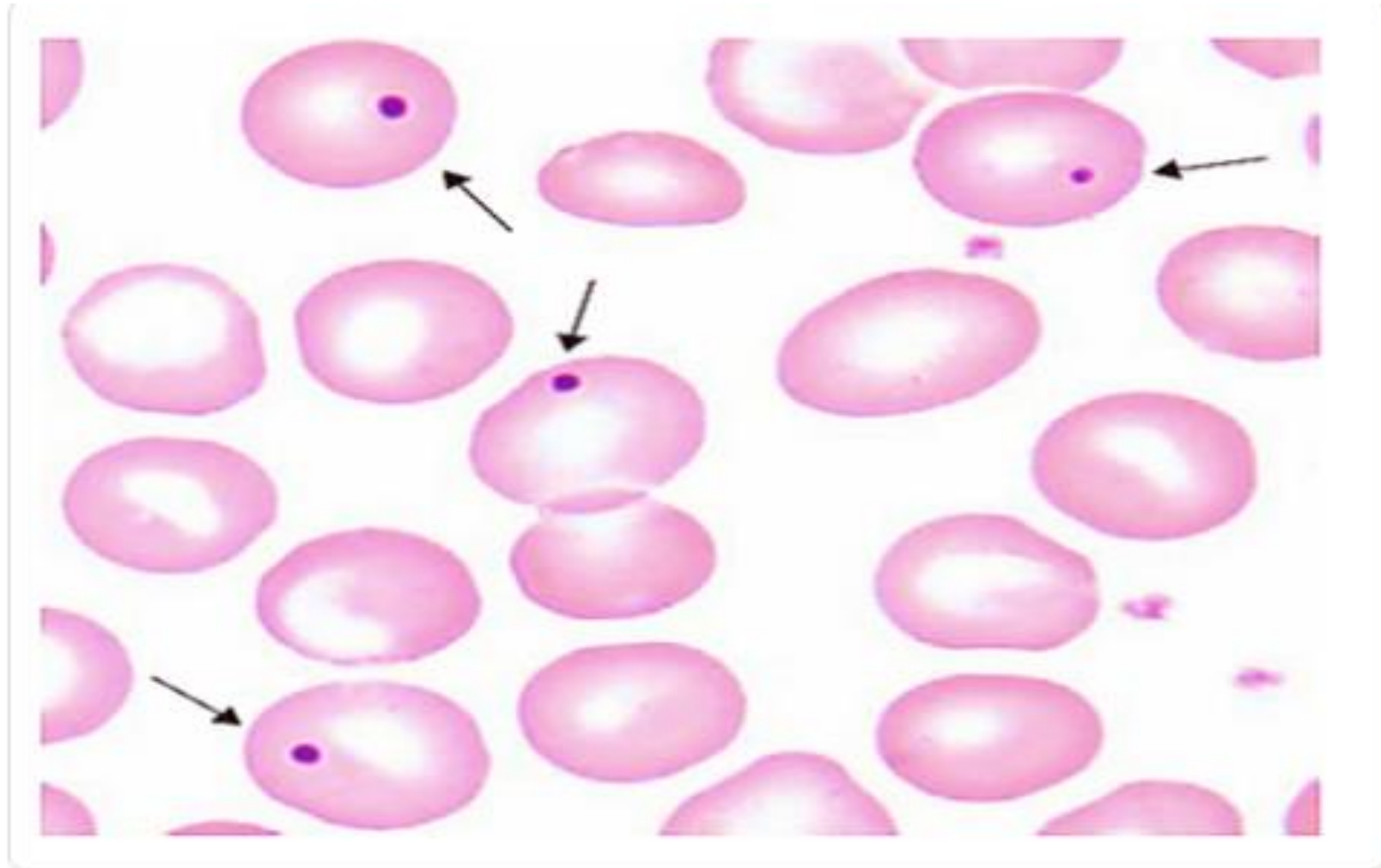
Incubation des globules dans le sérum humain.

Complexes antigène-anticorps à la surface des globules (GRS)

Ajout de l'AGH après lavage des GRS.

Agglutination car les globules rouges sont sensibilisés.

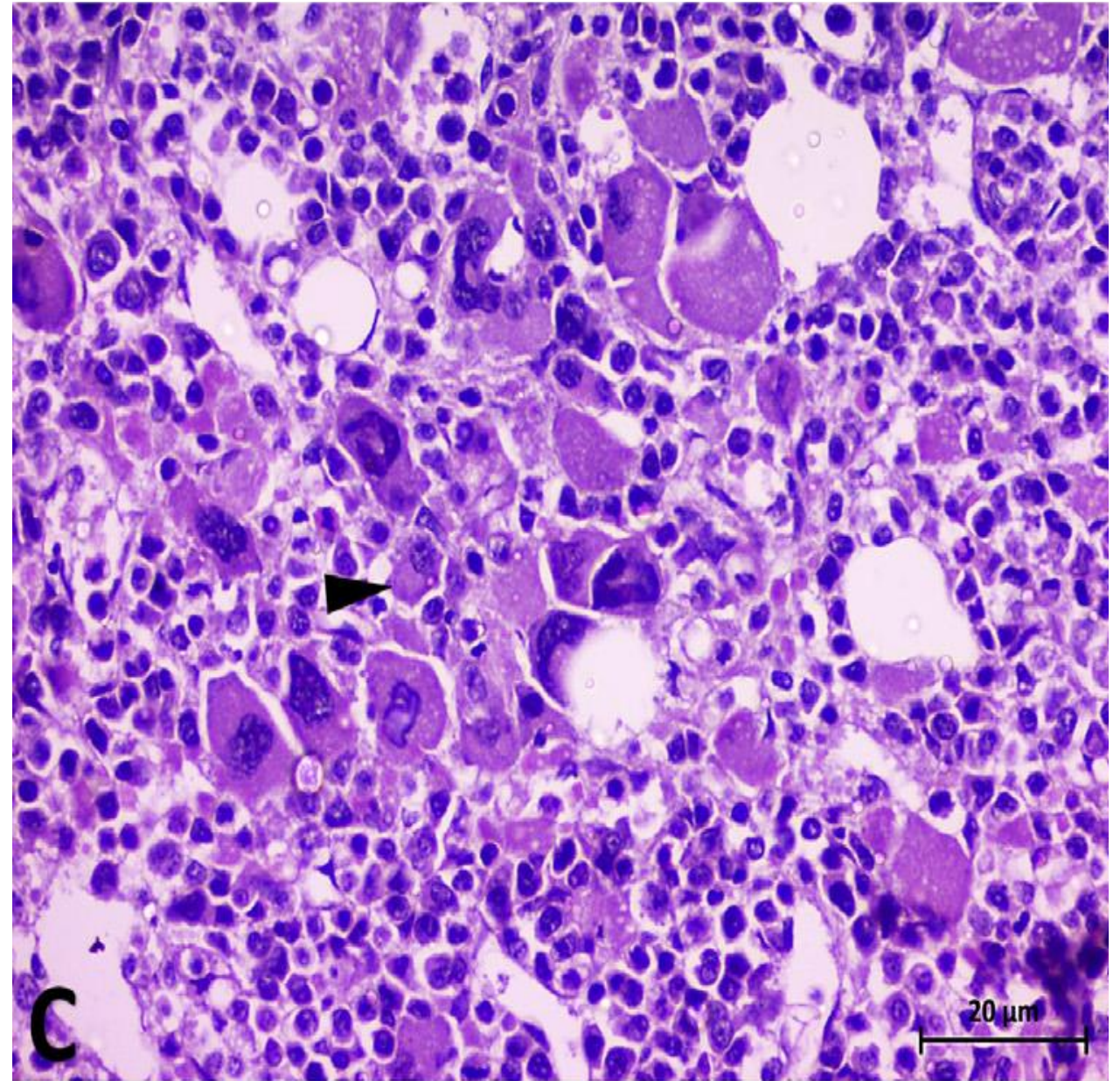
- Large numbers of circulating blasts (immature bone marrow cells), megakaryocytes and/or dysplastic cells (such as erythrocytes with Howell-Jolly giant bodies) may be found in cats with leukemia or myelodysplastic syndrome.
- Compared to uninfected cats, cats infected with FeLV are: nearly 3.8 times more likely to be anemic, 5 times more likely to be thrombocytopenic, 3.6 times more likely to be neutropenic and 2.8 times more likely to have lymphocytosis.



Corps de Howell-Jolly sur frottis sanguin

Acute myeloid leukemia
in a 6-year-old male cat/
FeLv.

There is an intense
proliferation of
megakaryocytes And of
micromegakaryocytes
atypical (arrowhead).



-Serum biochemistry and urine analysis

-Results of serum biochemistry and urine analysis are not specific and reflect the underlying pathological processes:

-Hyperbilirubinemia and bilirubinuria = In cats with immune-mediated hemolytic anemia.

-Cats with glomerulonephritis = Proteinuria.

-Some cats show signs of bacterial infections of the urinary tract
urinary = Cytobacteriological examination (ECBU),
Bacteriological culture (urine).

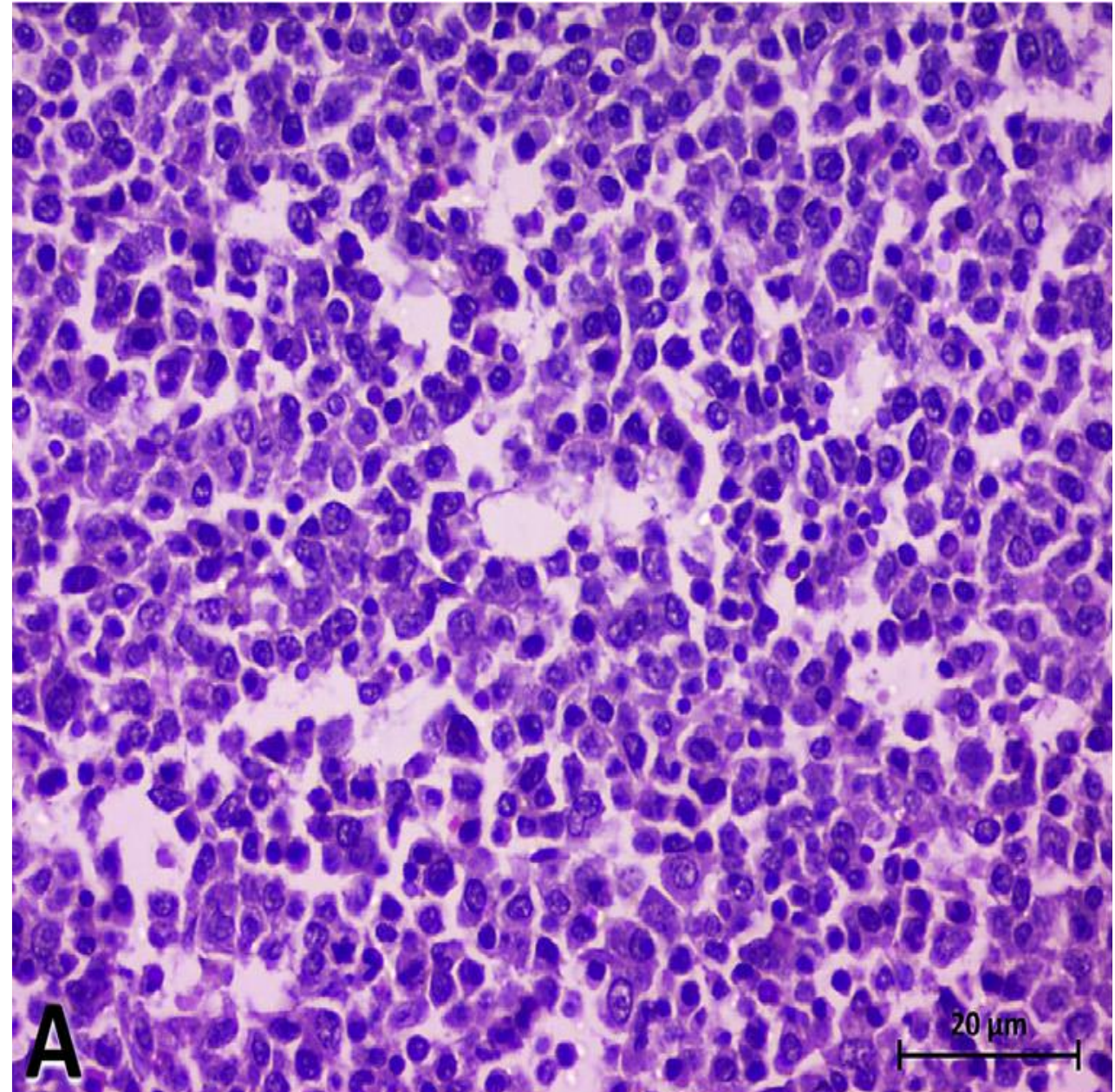
-Cytology and histopathology of bone marrow

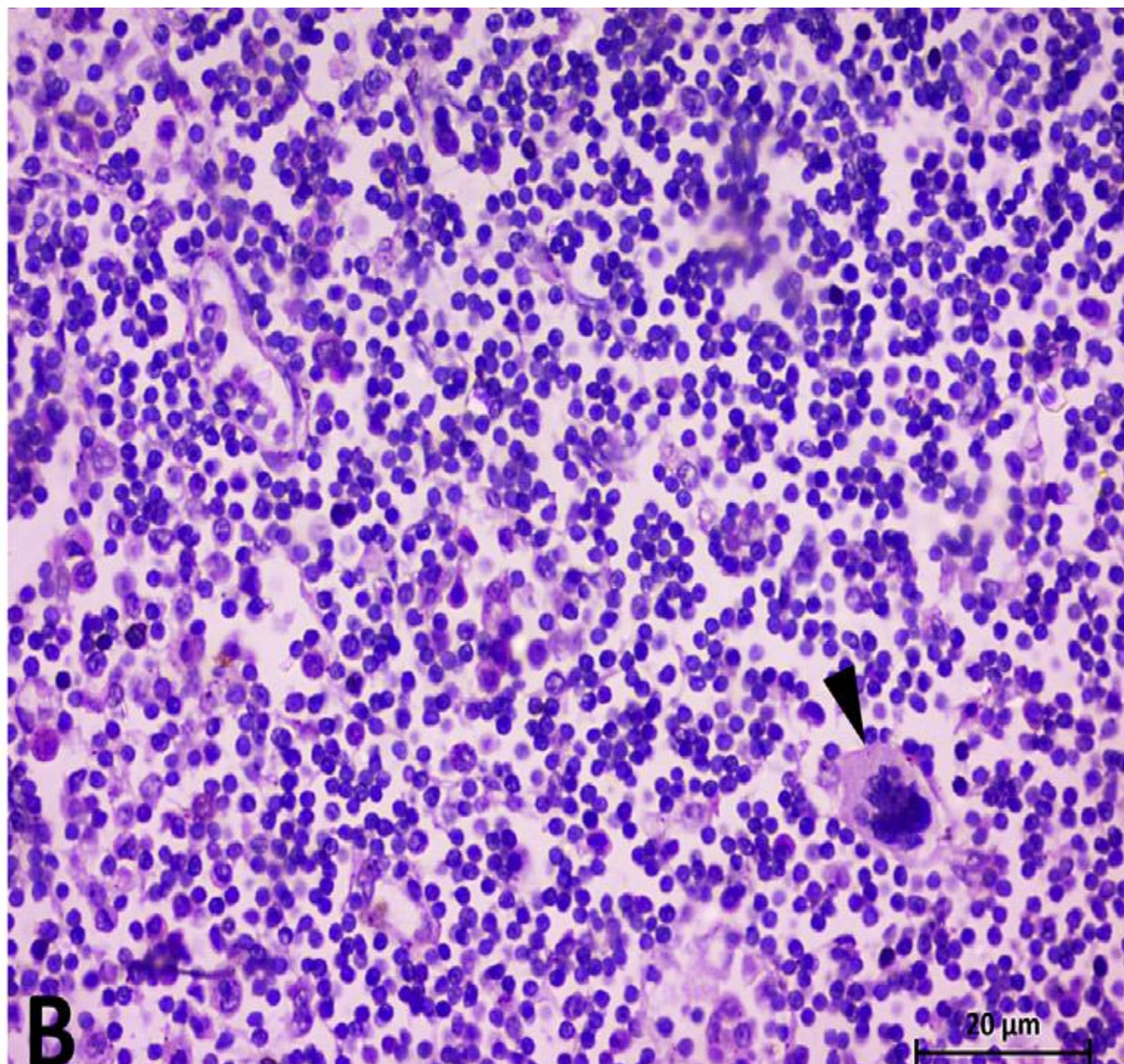
Findings in the bone marrow of FeLV-infected cats include:

- Signs of neoplastic lymphoid, erythroid or myeloid cells.
- Myelodysplasia.
- Hypoplasia or aplasia of one or all cell lines; or hyperplasia of one or all cell lines.

Fine needle aspiration of tumors, lymph nodes, fluids from body cavities or affected organs may reveal malignant lymphocytes.

Large lymphocytes
neoplastics invade the
entire parenchyma
medullary bone
marrow /FeLV
(leukemia myeloid
acute).





Imaging

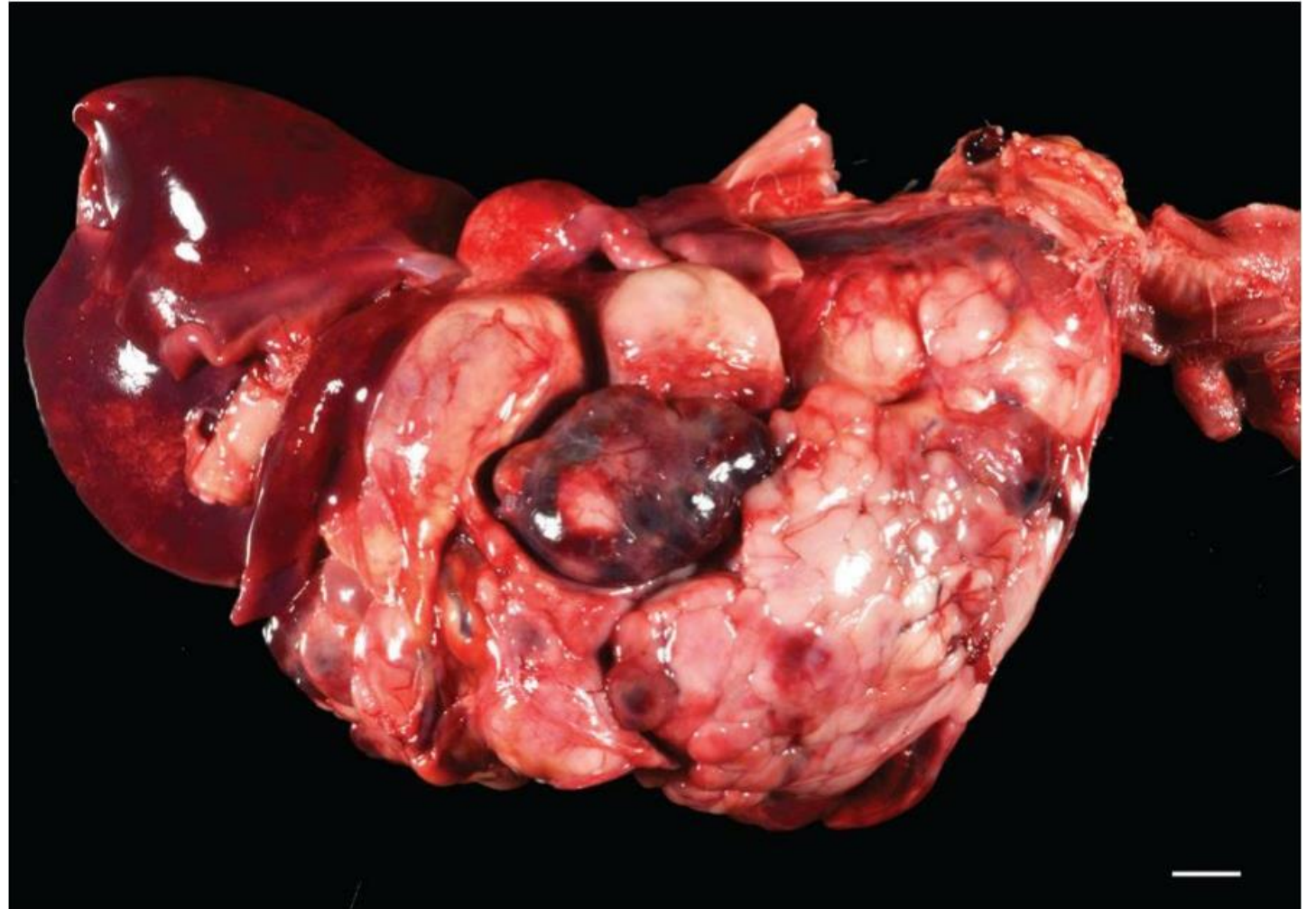
Imaging results in FeLV-infected cats reflect the underlying pathological process and are extremely variable:

- Cats with FeLV-associated thymic lymphosarcoma have a mediastinal mass on chest radiography which may be accompanied by mild to severe pleural effusion.



- Lateral thoracic radiograph of a 5-year-old neutered male shorthaired domestic cat with mediastinal lymphoma 11 months after testing positive for circulating FeLV antigen.
- Tachypneic + muffled heart sounds that were displaced caudally.
- Signs of pleural effusion and dorsal displacement of the trachea.
- Cytological examination of pleural fluid = large number of malignant lymphocytes.

**Mass mediastinal
in a cat suffering
from lymphoma
associated with FeLV.**



Lateral chest X-ray. Note the presence of the mass in the dorsal lung field.



Chest X-ray (PA view): mass located on the right side.

- Abdominal ultrasound in cats with multicentric lymphoma may reveal hypoechoic and enlarged abdominal lymph nodes, splenomegaly with hypoechogenicity or a "mottled" echotexture (marbling) of the spleen, liver or kidneys.
- Increased liver echogenicity can also occur during lymphoma.
- Intestinal masses with loss of normal intestinal wall stratification may also be detected.
- Splenomegaly and hepatomegaly may be present during AHMI.

-Immunological tests

- Antigen search**
- Rapid tests**
- IFA (Immunofluorescence Assay) tests.**

- **Rapid tests**

- Numerous rapid point-of-care tests for feline retroviruses are available = Rapid immunological tests:
- Immunochromatographic tests.
- Based on the ELISA principle.

Positive result in a rapid
ELISA test for FeLV.



- Sensitive, specific, rapid and widely available tests detect free (FeLV) antigen in the blood.
- A negative ELISA result is very reliable for ruling out a progressive infection.
- No false positives for vaccinated cats.
- Serum, plasma, and whole blood are the preferred samples for these tests.
- ELISA tests can be used on cats of any age and allow detection of the soluble p27 antigen of FeLV.

- The sensitivity of the IDEXX® SNAP Feline Triple® test (96.3%; test based on the ELISA method to accurately screen for FIV, FeLV and heartworm infestation in cats) (*Dirofilaria immitis*) is very high compared to the Witness FeLV-FIV test (82.9%; FIV and FeLV) and the VetScan Feline FeLV/FIV rapid test (75.6%; FIV and FeLV).

- **IFA (Immunofluorescence Assay) tests.**

oThe IFA test is the preferred confirmatory test for FeLV.

oThe IFA aims to detect p27 and other antigens.

structural.

oGenerally used to confirm a positive ELISA test and is more capable of detecting progressive infections.

- **Antibody testing**

Antibody assays are not readily available but can
to be used for:

- Detecting abortive infections: The detection of an abortive infection (Animal recovery) requires the identification of antibodies against FeLV. The presence of antibodies can help predict whether a cat is protected against a new infection.
- Antibody detection can act as a screening test
additional information to help decide if a cat should be vaccinated.

-PCR (Polymerase Chain Reaction)

- PCR tests can be performed by diagnostic laboratories using whole blood, bone marrow or other tissues and are sensitive enough to detect regressive infections (detection of provirus integrated into white blood cells).
- Cats that have eliminated FeLV from plasma are negative on ELISA and IFA but will remain positive by PCR for DNA.

Diagnostic Assays Available for Feline Leukemia Virus Infection

Assay	Specimen Type	Target	Performance
ELISA or similar immuno-chromatographic tests for soluble FeLV antigen	Serum, plasma, whole blood	FeLV p27 antigen	Confirmation of positive results is recommended in healthy cats with a second test from a different manufacturer. Positive antigen test results do not signify progressive infection, and the assay must be repeated in 1 to 3 months or an IFA performed. False negatives can occur in the first month of infection.
IFA	Serum, bone marrow	FeLV antigen in blood cells	Less sensitive than ELISA. Positive results indicate infection of the bone marrow and therefore progressive infection. False positives may occur if nonspecific fluorescence is interpreted as a positive result.
PCR	Blood, bone marrow, saliva (RT-PCR); bone marrow, tissue, lymph node aspirates (PCR)	FeLV RNA (RT-PCR) or proviral DNA	Sensitivity and specificity may vary between laboratories. Never use in the absence of antigen testing. Assays that have demonstrated sensitivity and specificity may be useful to detect cats with regressive infection for elimination from blood donor programs, or to resolve the results of discordant ELISA and IFA assays. False-negative test results may occur when variant strains are present.
Virus isolation	Blood, bone marrow	Replication-competent FeLV virus	Difficult, not widely available. Requires a specialized laboratory. Used primarily as a research tool.

IFA, immunofluorescent antibody; RT, reverse transcriptase.

Treatment

- FeLV infection is incurable and management aims to provide symptomatic care.
- Several immunomodulatory and antiretroviral treatments have been tried.
- The results of the treatment are highly variable and have not yet been the subject of controlled studies.
- Cats infected with FeLV can live for several years without major complications from the disease with routine prophylactic care, good husbandry conditions, minimal stress and prevention of secondary infections.

- Lymphoma = Solid tumor most frequently associated with FeLV infection.

Several chemotherapy combinations have been recommended to manage tumors:

- Administration of corticosteroids (as monotherapy) is not very effective as a single-agent treatment modality.

- Combined chemotherapy protocols are the most effective:

- o“CHOP” protocol (cyclophosphamide, hydroxydaunorubicin [doxorubicin], Oncovin [vincristine] and prednisone).

- oVariants of the CHOP Protocol: Administration of cyclophosphamide, then vincristine combined with prednisone is also an effective protocol.

- After the treatment, it is important to emphasize that:
- In most cases, only cats (with lymphoma) that achieve complete remission after induction chemotherapy obtain long-term disease-free status.
- In cats with mediastinal or multicentric lymphoma, complete remission rates of up to 90%.
- Subjects with aggressive gastrointestinal lymphoma do not fare as well; about one-third to two-thirds of cats will achieve complete remission and the 1-year survival rate is about 20 to 40%.
- Cats with myelosuppressive disease have a poor prognosis and are managed with the administration of whole blood to resolve anemia.

-Treatment protocols in the management of clinical signs of feline infections by FeLV and/or FIV.

Traitements
immunomodulateurs

- **Protéine staphylococcique A** (SPA : Staphylococcal protein A, Kabi Pharmacia, Inc) (10 µg/kg IP deux fois par semaine). Continuez au besoin. Le médicament peut être utilisé chez les chats pendant des périodes allant jusqu'à 8 semaines. Aucune amélioration de l'immunité humorale n'a été décrite
- **Acémannane** ("Acemannan" en anglais, Carrisyn, Carrington Laboratories) (2 mg/kg IP une fois par semaine pendant au moins 6 semaines) est dérivé de la plante *Aloe vera* et a été utilisé pour améliorer la fonction immunitaire. Toutefois, aucune amélioration clinique ou des ratios CD4/CD8 n'est décrite après 8 semaines de traitement
- ***Propionibacterium acnes*** (ImmunoRegulin[®], ImmunoVet[®]) (0,2 -0,5mg/chat IV une ou deux fois par semaine selon les besoins). Le médicament stimule les macrophages et améliore l'activité des lymphocytes T. Certains auteurs suggèrent que cela conduit à une amélioration clinique, toutefois, elle n'a jamais été décrite
- **Interféron-alpha humain recombinant (rHuIFN)** (Roferon-A, Hoffmann LaRoche). Médicament utilisé pour ses activités antivirales et immunomodulatrices. Divers schémas posologiques sont décrits :
 - Forte dose : 1 000 à 10 000 U/kg IM q24h pendant 3 à 7 semaines. Le traitement au-delà de cette période est associé à des anticorps anti-interférons
 - Faible dose : 30 U PO q24h à vie
 - Administrer 50 UI quotidiennement par voie muqueuse (PO par exemple) pendant 7 jours pendant 6 mois sur des semaines alternées. Ensuite, faire une pause de 2 mois et répéter à nouveau
- **Interféron oméga recombinant d'origine féline (Virbagen Omega[®])** a également été utilisé pour traiter les maladies liées au FeLV pour ses activités antivirales et immunomodulatrices. Administrer à la dose de 10⁶ UI/kg SC q24h pendant 5 jours consécutifs, répété trois fois avec plusieurs semaines d'intervalle entre les traitements : jours 0, 14 60.

<p>Traitements antiviraux</p>	<ul style="list-style-type: none"> • Azidothymidine (AZT, appelée, également Zidovudine ou Retrovir, GlaxoSmithKline) est un antiviral qui bloque la transcriptase inverse des rétrovirus. 5–10 mg/kg PO ou SC q12h pendant 3 semaines. Administré à la dose de 5–10 mg/kg PO ou SC q12h (q8h) pendant des périodes allant jusqu'à 4 à 6 semaines selon le degré de toxicité de la moelle osseuse (anémie). Alternativement, administré à 15 mg/kg PO q12h, toutefois, des doses plus élevées doivent être utilisées avec prudence en raison des effets secondaires potentiels • 9-(2-Phosphonylmethoxyethyl) adenine (PMEA) (2,5 mg/kg SC q12h [durée non stipulée]). • Raltégravir : Médicament antiviral utilisé pour traiter les infections à VIH (virus de l'immunodéficience humaine) chez les humains. Commencer à 40 mg PO q12h, augmenter progressivement jusqu'à 80 mg PO q12h. Traiter pendant 9 semaines
<p>Lymphome/lymphosarcome associé au FeLV</p>	<p>Les glucocorticoïdes en monothérapie ont une efficacité minimale et sont donc réservés à la prise en charge palliative. Un traitement médicamenteux combiné est recommandé :</p> <ul style="list-style-type: none"> • Traitement d'induction (semaines 1 à 4) : <ul style="list-style-type: none"> ○ Cyclophosphamide (Cytosan, Bristol-Myers) (300 mg/m² PO administré une fois les semaines 1 et 4 uniquement) ○ + Vincristine (Oncovin, Eli Lilly) (0,75 mg/m² IV administré une fois par semaine les semaines 1, 2, 3 et 4) ○ + Prednisone (2 mg/kg PO q24h pendant 4 semaines) • Traitement d'entretien (au-delà de 4 semaines) : <ul style="list-style-type: none"> ○ Interrompre le cyclophosphamide et la vincristine ○ Continuer la prednisone quotidiennement comme indiqué ci-dessus. Une fois que le chat est en rémission, la dose de médicament est progressivement réduite sur 3 semaines, puis arrêtée ○ À partir de la semaine 7, administrer de la doxorubicine (25 mg/m² IV une fois toutes les 3 semaines) jusqu'à ce qu'il soit déterminé que le chat est en rémission

<p>Cytopénie</p>	<ul style="list-style-type: none"> • Érythropoïétine humaine recombinante (rHuEPO) (100 U/kg SC q48h) peut être utilisée chez les chats présentant l'anémie. Administré pendant au moins 3 à 4 semaines ou jusqu'à ce que l'hématocrite souhaité soit atteinte. On estime qu'entre 20 % et 30 % des chats traités avec la rHuEPO développent des anticorps anti-érythropoïétine 6 à 12 mois après le début du traitement • Facteur de stimulation des colonies de granulocytes (G-CSF) est recommandé chez les chats qui développent une neutropénie persistante liée au FeLV (5 µg/kg SC q24h jusqu'à ce que le nombre de neutrophiles dépasse $30 \times 10^3/\mu\text{l}$ pendant 2 jours) • Immunomodulateur lymphocytaire T (LTCI) est un traitement approuvé aux Etats-Unis pour les chats infectés par le FeLV et le FIV, et les symptômes associés : lymphopénie, infection opportuniste, anémie, granulocytopenie, thrombocytopenie. Le médicament est administré à la dose de 1 µg/chat SC aux jours 0, 7 et 14. Injections ultérieures mensuelles ou bimensuelles selon les besoins
<p>Stomatite</p>	<ul style="list-style-type: none"> • Métronidazole (5 mg/kg PO q8h 2-4 semaines selon les besoins) • Clindamycine (12,5 mg/kg PO q8h 2-4 semaines) • Prednisone (5 mg par chat PO q12h 2-4 semaines) • Lactoferrine bovine (40 mg/kg appliqué directement sur la muqueuse buccale, q24h au besoin)

Prognosis

- Prognosis = Very variable, depending on the specific disease that manifests during the infection and the availability of supportive treatment for secondary infections.
- A very small percentage of FeLV-positive cats can remain healthy for several years; the prognosis for persistently FeLV-positive cats is poor.
- Most positive cats (80%) are expected to die within 3 years of diagnosis.
- Domestic cats living alone who are persistently infected and receiving supportive medical care could potentially have longer survival times.

Prevention

-Healthy cats infected with FeLV should be kept indoors and kept away from other cats in order to limit the risk of transmission of the disease; veterinary checks must be carried out at least every 6 month.

-Infected cats must be neutered and spayed and always kept indoors. not only to prevent the spread of the infection to other cats, but also to reduce the risk of exposing infected cats to infections opportunists.

- When a cat in a group tests positive for the antigen, all cats in the household should be tested and, if possible, all positive cats should be separated from negative cats.
- Infected and uninfected cats should not share food and water bowls or litter boxes.
- Euthanasia of sick cats positive for FeLV in a community can be considered.

- People who acquire cats whose retrovirus status is unknown should be informed of the need to quarantine and test them (after and, before adding the cat to the household).
- FeLV lives outside the host for only a few minutes and is sensitive to all disinfectants, including soap, hence the need for routine cleaning procedures to prevent transmission of the virus within the group.

Vaccination

- Screening and vaccination of cats deemed at risk are key factors in the prevention of FeLV.
- Currently, several types of vaccines are on the market and offer
Relatively good protection against FeLV: virus vaccines
Whole inactivated vaccines (with adjuvant), subunit vaccines (with adjuvant) and recombinant vaccines (without adjuvant) are available.

- Vaccination against FeLV is not part of the routine valences (non-essential).
- However, cats at potential risk of exposure (cats residing outdoors, living in groups or living with known FeLV positive cats; kittens are also susceptible to infection) should be vaccinated.
- As with any vaccination decision, risk assessment must be made on an individual basis, taking into account lifestyle factors and local prevalence.

-None of the currently available FeLV vaccines will cause tests false positives for FeLV antigen on IFA or ELISA tests.

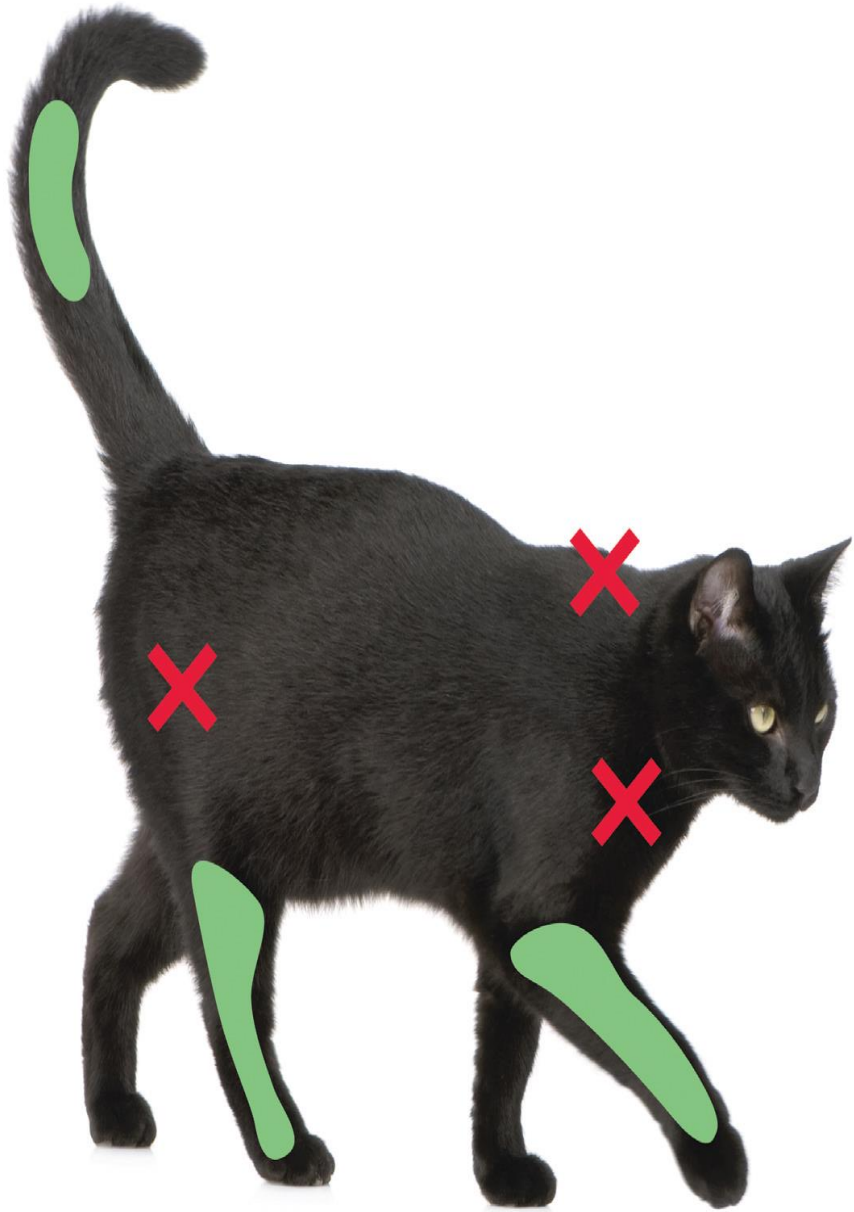
However, the FeLV test must be performed before FeLV vaccination. to establish the status of FeLV infection.

-Kittens should be vaccinated at 8 to 9 weeks of age, with a second vaccination at 12 weeks, followed by a booster 1 year later.

Guidelines for Vaccination of Individual Pet Cats—cont'd

Vaccine	Initial Vaccination		Booster Schedule	Comments
	Age ≤ 16 Weeks	Age > 16 Weeks		
FeLV (I, SC)	Two doses 3-4 weeks apart starting at 8 weeks of age	Two doses, 3-4 weeks apart	1 year, then every 3 years thereafter when risk is ongoing. Beyond 1 year of age, age-related resistance may provide protection.	Noncore. * Only for FeLV-negative cats. FeLV testing before administration mandatory before first administering the vaccine to kittens and if exposure was likely before, booster immunization is required. Can provide strong protection. ¹³ Vaccine-associated sarcoma task force recommended administration as distal as possible in the left pelvic limb
FeLV (recombinant canarypox, SC)	Two doses 3-4 weeks apart starting at 8 weeks of age	Two doses, 3-4 weeks apart	Annual when risk is ongoing. [†] Beyond 1 year of age, age-related resistance may provide protection.	Noncore. * Only for FeLV-negative cats (see FeLV (I, SC)). More data are required on relative efficacy and whether these are associated with a reduced risk of injection-site sarcomas. Vaccine-associated sarcoma task force recommended administration as distal as possible in the left pelvic limb.
FeLV (subunit, SC)	Two doses, 3 weeks apart, starting at 8 weeks of age	Two doses, 3 weeks apart	Annual when risk is ongoing. [†] Beyond 1 year of age, age-related resistance may provide additional protection.	Inactivated whole virus vaccines may provide superior protection. ¹³ See above.

I, inactivated;SC, subcutaneous.



- **Vaccination sites:**
recommended injection sites in the distal limbs and tail.

Sarcomas at the injection site (vaccine in the majority of cases).



- Vaccine-associated sarcoma (VAS) in cats has been associated with FeLV vaccination as well as a wide variety of other vaccines and injections.
- Extensive studies have shown that VAS in cats is not the result of a vaccine virus returning to a virulent state and causing a tumor.
- A familial predisposition in certain cat families to develop tumors has also been suggested.

Public health

-FeLV has been the subject of in-depth studies regarding its potential zoonotic.

-Although there are available studies suggesting that a human infection

Transmission via FeLV might be possible, but no human has ever been infected by it.

FeLV and no human leukemia has ever been attributed to the antigen of

FeLV.

-Currently, FeLV in cats is not considered a danger

for human health.