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MORPHOLOGICAL BLOOD PARAMETERS IN DOGS WITH ORAL CAVITY NEOPLASMS**Yulchiyev Jasurbek Baxodirovch**– Scientific Supervisor**Ravshanov Mirjalol Akmal o'g'li**, PhD**Toyirov Davlatbek Parvoz o'g'li**, – Master's Student
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Abstract: *The high prevalence of oral diseases and oncological disorders in dogs, together with the growing need for regenerative treatment approaches in clinical veterinary practice, highlights the relevance of this problem. In the present study, the dynamics of peripheral blood morphological parameters in dogs affected by infectious-inflammatory and neoplastic processes of the oral cavity were evaluated. In addition, the clinical and morphological efficacy of platelet-rich plasma (PRP) therapy in the treatment of erosive lesions of the oral mucosa was assessed. Particular attention was given to hematological changes associated with the pathological process and to the reparative response of the affected tissues following treatment.*

Keywords: *dogs, oral cavity neoplasms, hemogram, neutrophilia, lymphopenia, platelet-rich plasma, PRP therapy, reparative regeneration, epithelialization.*

Introduction: The diagnosis and effective management of oral cavity neoplasms in dogs remain among the major challenges in contemporary veterinary oncology. Benign and malignant neoplasms of the oral cavity are frequently encountered in clinical practice and are characterized by variable biological behavior, including locally aggressive growth and, in malignant cases, a potential for metastasis. These pathological conditions can substantially compromise the general health status and quality of life of affected animals. Although surgical intervention remains one of the principal treatment modalities for oral cavity neoplasms, the anatomical location, size, extent of the lesion, and metastatic potential of the tumor may limit the applicability of surgery as a sole therapeutic approach. Therefore, modern veterinary oncology increasingly emphasizes multimodal treatment strategies that combine

surgical intervention with conservative therapeutic modalities, including chemotherapy, radiation therapy, and immunomodulatory approaches. Conservative treatment may contribute to reducing postoperative complications and improving tissue recovery. Moreover, in cases in which complete surgical excision is not feasible, such approaches may play an important role in prolonging survival and maintaining an acceptable quality of life.

The present study comparatively evaluates morphological parameters of peripheral blood in dogs with oral cavity neoplasms and analyzes hematological findings obtained from the experimental groups during the treatment process. Particular emphasis is placed on changes in hematological parameters as potential indicators of the systemic response to neoplastic and inflammatory processes.

Relevance of the Study: Oral cavity neoplasms in dogs represent an important problem in veterinary oncology due to their relatively frequent occurrence, locally invasive behavior, and potential for metastasis. The clinical significance of this condition is further increased by the fact that oral tumors are often diagnosed at advanced stages in clinical practice. Late diagnosis may substantially limit the available therapeutic options, reduce the effectiveness of treatment, and adversely affect the prognosis and quality of life of affected animals. Consequently, the assessment of hematological changes associated with oral cavity neoplasms is of considerable clinical importance. Evaluation of peripheral blood morphology may provide additional information regarding the systemic inflammatory and immune response to the neoplastic process and may contribute to monitoring the clinical condition of affected animals during treatment.

This substantially reduces the effectiveness of treatment. Currently available conventional therapeutic approaches do not always produce the expected clinical outcomes, while the incidence of postoperative complications remains relatively high. One of the major gaps in this field is the insufficient investigation of systemic changes occurring in the organism in association with local tumor progression,

particularly alterations in morphological and hematological blood parameters. In many cases, treatment protocols are established primarily on the basis of the visually assessed tumor size without adequately considering dynamic changes in hematological parameters. Therefore, one of the most important aspects requiring further investigation is the monitoring of the effects of various surgical and conservative treatment approaches on the animal organism through the assessment of morphological blood parameters, including the leukocyte differential count, erythrocyte dynamics, and hemoglobin concentration. Comparative analysis of blood morphological parameters in experimental groups may contribute to the prediction of disease progression and prognosis and to the development of safer and more appropriate therapeutic strategies based on the individual reactivity of the organism. This represents an important objective for contemporary veterinary science.

Materials and Methods: The study was conducted during 2024–2026 at the Surgical Clinic of the Department of Veterinary Surgery and Obstetrics, Samarkand State University of Veterinary Medicine, Animal Husbandry and Biotechnology. Six dogs, aged up to 8 years, diagnosed with oral cavity neoplasms and originating from selected areas of the Samarkand Region were included in the study. The dogs affected by oral cavity neoplasms underwent surgical treatment at different time points. Blood samples were collected on postoperative days 5, 10, and 15, beginning from the day of surgery, and hematological analyses were subsequently performed. In the present article, only the hematological findings obtained on postoperative day 10 are presented. For comparative evaluation, blood samples were collected from six clinically healthy dogs and the obtained hematological parameters were compared with those of the dogs included in the experimental group. To determine the morphological parameters of peripheral blood in the experimental animals, a Dymind DF56 Vet automated veterinary hematology analyzer (Dymind Biotechnology Co., Ltd., China) was used. The analyzer was employed to perform

a complete blood count and to assess the dynamics of major hematological parameters, including white blood cell count (WBC), red blood cell count (RBC), hemoglobin concentration (HGB), as well as other differential hematological indices.

Aim of the Study: The aim of the study was to perform a three-dimensional assessment of the microcirculatory vascular network within the lamina propria of the gingival, alveolar, buccal, palatal, and lingual mucosa in dogs. For this purpose, resin corrosion casts of the vascular structures were prepared and subsequently examined in detail using scanning electron microscopy [1, 447–459].

The present study also describes the histological structure of an amelanotic melanoma diagnosed in a Doberman dog. Cytological examination of the partially pigmented, firm neoplastic mass revealed round-to-oval neoplastic cells exhibiting anisocytosis and anisokaryosis. Histopathological examination demonstrated both epithelioid and spindle-cell components. Vascular invasion by neoplastic cells and multifocal hyperplasia of the overlying mucosa were also identified, thereby confirming the final diagnosis. [2;]

Pathological conditions of the buccal mucosa, which are frequently encountered in oral surgery, are often associated with disturbances in local blood circulation. Therefore, assessment of the microcirculatory dynamics of peripheral blood vessels within these tissues is of considerable therapeutic importance. However, research in this area remains limited. The available literature has predominantly focused on the morphological distribution of blood vessels, whereas studies investigating microcirculation dynamically remain relatively scarce, largely due to the technical challenges associated with its assessment. Consequently, most existing studies in this field have primarily addressed methodological aspects [3; 153-162.].

Groups I and II – Experimental groups

Group I – Surgical treatment only (control group):	Gamavit was administered at a dose of 2 g intramuscularly (IM) for 10 consecutive
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	days, in combination with ASD-2 fraction, administered orally (per os) for 1 month.
Group II – Surgical resection:	Butasal was administered at a dose of 3 g intramuscularly (IM) for 10 consecutive days, in combination with ASD-2 fraction, administered orally (per os) for 1 month.

Group I: Surgical Treatment Only (Control Group)

In this group, the treatment protocol consisted primarily of surgical intervention followed by conventional postoperative care and supportive immunostimulatory therapy. Primary treatment:

Dogs underwent surgical intervention for removal of the oral cavity lesion. No additional antineoplastic treatment was performed. Postoperative care and supportive therapy:

- Gamavit: Administered intramuscularly (IM) at a dose of 2 g for 10 consecutive days. The preparation was used as supportive therapy aimed at improving the general physiological status of the animals, supporting immune function, and promoting tissue recovery and reparative processes.

- ASD-2 fraction: Administered orally (per os) at a dose of 3 g for 1 month. It was used as an adjunctive supportive preparation intended to improve tissue trophism and enhance the adaptive and immunomodulatory response of the organism.

Group II: Surgical Resection Combined with Adjunctive Therapy

In this group, radical removal of the pathological lesion was combined with adjunctive pharmacological therapy intended to support metabolic processes and the functional recovery of the organism. Primary treatment:

Surgical resection of the pathological tissue or affected portion of the organ was performed to achieve removal of the neoplastic lesion. Postoperative intensive supportive therapy:

- Butasal: Administered subcutaneously (SC) at a dose of 3 g for 10 consecutive days. The preparation was used as supportive therapy with the aim of supporting

metabolic processes, improving the general physiological status of the animals, and reducing the effects of postoperative stress.

- ASD-2 fraction: As in Group I, ASD-2 fraction was administered orally (per os) at a dose of 3 g for 1 month to support the general resistance and adaptive reactivity of the organism. The treatment protocols were subsequently evaluated by monitoring the morphological and hematological parameters of peripheral blood and comparing the results obtained between the experimental groups and the control group.

Morphological Blood Parameters of Dogs in the Experimental Groups

($M \pm m$, $n = 6$)

Parameter	Reference range	Group I (n=3)	Group II (n=3)
Hemoglobin (HGB), g/l	110-160	108,5 $\pm$ 2,1	112,0 $\pm$ 3,4
Red blood cells (RBC), $10^{12}/l$	3,5-5,5	4,2 $\pm$ 0,3	4,5 $\pm$ 0,2
White blood cells (WBC), $10^9/l$	4,9-9,0	11,8 $\pm$ 1,2	10,5 $\pm$ 0,8
Platelets (PLT), $10^9/l$	180-320	420 $\pm$ 15,0	385 $\pm$ 12,0
Segmented neutrophils, %	47-72	74,0 $\pm$ 2,5	70,0 $\pm$ 3,0
Lymphocytes (LYM), %	19-37	15,2 $\pm$ 1,4	22,0 $\pm$ 1,8
Monocytes (MID), %	3-11	9,0 $\pm$ 0,8	7,5 $\pm$ 1,1
Erythrocyte sedimentation rate (ESR), mm/h	2-15	22,0 $\pm$ 2,5	18,5 $\pm$ 3,0

Hemoglobin (HGB): The reference range was 110–160 g/L. In Group I, the mean hemoglobin concentration was slightly below the reference range (108.5 $\pm$ 2.1 g/L), whereas in Group II it remained close to the lower reference limit (112.0 $\pm$ 3.4 g/L). These findings may indicate a mild postoperative anemic state or a possible consequence of perioperative blood loss.

Red blood cells (RBC): The RBC count remained within the physiological reference range of $3.5\text{--}5.5 \times 10^{12}/\text{L}$ in both groups. This finding suggests that erythropoiesis was not substantially impaired during the postoperative period.

White blood cells (WBC): Despite the reference range of $4.9\text{--}9.0 \times 10^9/\text{L}$, elevated WBC counts were observed in both groups, indicating leukocytosis. The WBC count was $11.8 \pm 1.2 \times 10^9/\text{L}$ in Group I and $10.5 \pm 0.8 \times 10^9/\text{L}$ in Group II. This leukocytosis may represent a physiological response to surgical trauma and the initial inflammatory process occurring in the organism. The comparatively lower WBC count in Group II, which was closer to the reference range, may suggest a more favorable postoperative response following combined therapy.

Platelets (PLT): The reference range was $180\text{--}320 \times 10^9/\text{L}$. Pronounced thrombocytosis was observed in both groups, with platelet counts of $420 \pm 15.0 \times 10^9/\text{L}$ in Group I and $385 \pm 12.0 \times 10^9/\text{L}$ in Group II. This increase may be associated with reactive activation of hemostatic mechanisms following surgical intervention and the effects of inflammatory mediators.

Segmented neutrophils: The reference range was 47–72%. The proportion of segmented neutrophils was $74.0 \pm 2.5\%$ in Group I and $70.0 \pm 3.0\%$ in Group II. The reactive increase in neutrophils, particularly in Group I, may reflect an acute inflammatory response and increased activation of the innate immune system.

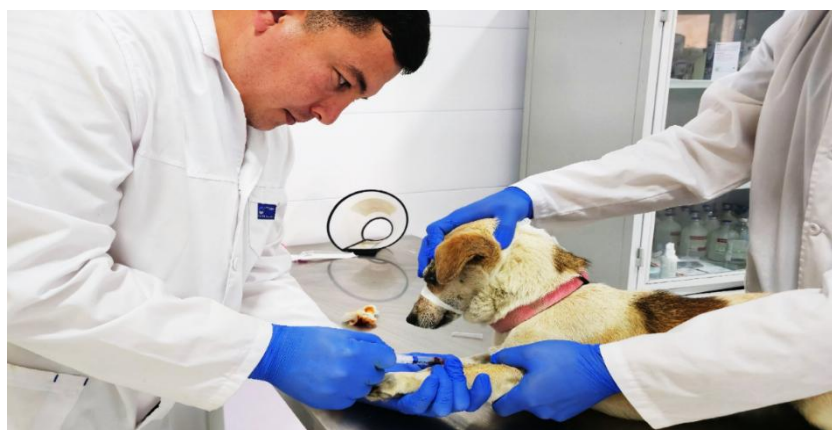


Figure 1. Blood sampling from the cephalic vein of the dog's forelimb.

Lymphocytes (LYM): The reference range was 19–37%. In Group I, the lymphocyte proportion was moderately decreased ($15.2 \pm 1.4\%$), which may indicate a degree of immunological suppression, potentially associated with postoperative stress or a persistent inflammatory process. In Group II, the lymphocyte count remained within the reference range ($22.0 \pm 1.8\%$), suggesting that the therapeutic regimen applied in this group may have supported a more balanced immune response.

Monocytes (MID): Monocyte percentages in both groups ($9.0 \pm 0.8\%$ and $7.5 \pm 1.1\%$, respectively) remained within the physiological reference range of 3–11%. This finding may indicate a relatively stable monocyte response during the postoperative period and may be consistent with the persistence of a localized chronic inflammatory or proliferative process.



Figure 2. Results of the morphological examination of peripheral blood.

Erythrocyte Sedimentation Rate (ESR): Compared with the reference range of 2–15 mm/h, ESR was elevated in both groups, reaching 22.0 ± 2.5 mm/h in Group I and 18.5 ± 3.0 mm/h in Group II. The increased ESR may be associated with an ongoing inflammatory response or tissue injury during the postoperative period.

Overall Clinical Assessment: The findings presented in the table indicate the presence of a moderate postoperative inflammatory response in the animals, characterized by leukocytosis, relative neutrophilia, and an increased ESR.

However, in Group II, which received surgical resection combined with Butasal and ASD-2 therapy, WBC and ESR values were closer to the reference ranges, while the proportion of lymphocytes returned to within the physiological range. These findings suggest that the combined treatment protocol may have had a more favorable effect on the immunophysiological status of the animals and may have supported postoperative recovery more effectively than surgical treatment alone

Conclusion: In dogs with oral cavity neoplasms and associated inflammatory complications, the erythrocyte system of peripheral blood, including red blood cell count and hemoglobin concentration, remained relatively stable and generally within the reference range. In contrast, the principal hematological manifestations of the systemic pathological response included leukocytosis, stress-associated lymphopenia, neutrophilia, thrombocytosis, and a marked increase in the erythrocyte sedimentation rate (ESR). Limitations of the conventional surgical approach (Group I). In dogs with oral mucosal neoplastic and erosive lesions, surgical treatment followed by postoperative administration of Gamavit and ASD-2 fraction was associated with the persistence of inflammatory changes during the early postoperative period. This was reflected by an elevated WBC count ($11.8 \pm 1.2 \times 10^9/L$), increased ESR (22.0 ± 2.5 mm/h), and lymphopenia ($15.2 \pm 1.4\%$). Potential efficacy of combined PRP therapy (Group II). The combined treatment protocol involving surgical resection followed by administration of the metabolic supportive agent Butasal, the immunomodulatory preparation ASD-2, and platelet-rich plasma (PRP) therapy was associated with more favorable hematological dynamics. This combination appeared to reduce the postoperative inflammatory response, with WBC counts ($10.5 \pm 0.8 \times 10^9/L$) and ESR values (18.5 ± 3.0 mm/h) approaching the respective reference ranges.

Regenerative and immunological recovery. The growth factors contained in platelet-rich plasma may contribute to enhanced reparative regeneration and epithelialization of damaged tissues. In parallel, stabilization of the

immunophysiological status was observed, as reflected by restoration of the lymphocyte proportion to $22.0 \pm 1.8\%$.

Practical recommendation. Based on the findings of the present study, the combined therapeutic protocol applied in Group II—surgical resection followed by Butasal, ASD-2 fraction, and PRP autologous plasma therapy—may be recommended as a promising adjunctive approach in the postoperative management of dogs with oral cavity neoplasms and destructive mucosal lesions. Its application may help reduce postoperative inflammatory complications and support tissue repair.

Note: The numerical values in the conclusion should be checked against the corresponding tables and methodology before submission. In particular, the text mentions PRP therapy in Group II, whereas the previously provided treatment protocol for Group II listed surgical resection + Butasal + ASD-2 only. For a journal submission, these sections should be made fully consistent.

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