

LESSON № 19

Topic: ANEMIAS

Aim of lesson: to study causes and mechanisms of different types of anemias. Analyse changes in blood in patients with different types of anemias.

QUESTIONS:

1. Anemias. Clinical symptoms of anemia and mechanisms of their development.
2. Classification of anemia by:
 - etiopathogenesis:
 - posthemorrhagic (of blood loss),
 - due to the erythropoietic disorders,
 - hemolytic,
 - color parameter (index),
 - severity of anemia,
 - regenerative possibility,
 - mechanism of erythropoiesis,
 - erythrocyte's size.
3. Posthemorrhagic anemia. Description, types, causes, hematological signs of blood in acute and chronic posthemorrhagic anemias.
4. Iron deficiency anemias. Etiology, pathogenesis, manifestations, Hematological signs. Sideropenic syndrome.
5. Megaloblastic anemias (vitamin B₁₂, folic acid deficiency). Etiology, pathogenesis. Manifestations. Hematological signs. Addison-Biermer disease.
6. Aplastic anemia: causes and pathogenesis, hematological signs.
7. Hemolytic anemias. Types (congenital, autoimmune e.g.). Common causes, manifestations, hematological signs. Clinical symptoms.
8. Hereditary spherocytosis: pathogenesis, manifestations, hematological signs.
9. Sickle cell disease: pathogenesis, manifestations, hematological signs.
10. Thalassemia syndromes: types, pathogenesis, manifestations,

hematological signs.

11. Newborn hemolytic anemia.

Laboratory work 1. *Measurment of hemoglobin concentration in the blood by Sali method*

Description of the work. Few drops of 0,1N HCl solution should be added to cylinder of the Sali hemometer untill low border.

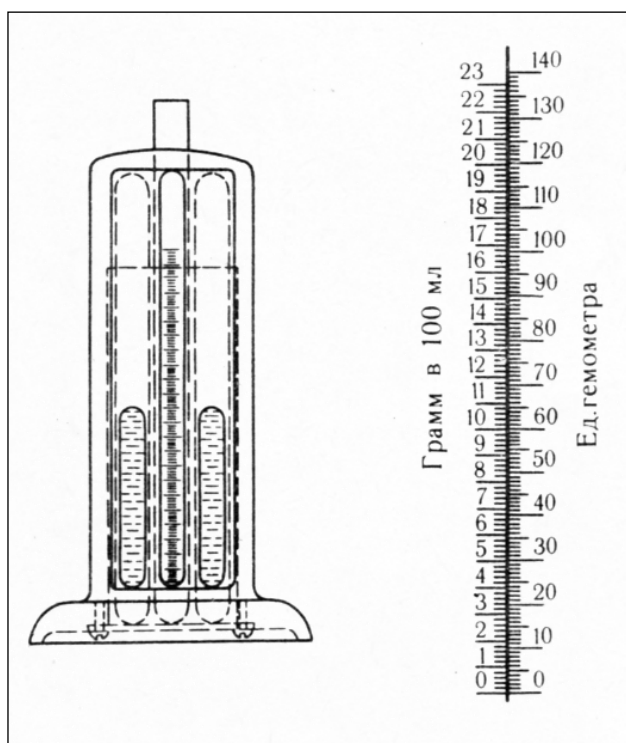


Fig. 19.1 – Sali hemometr

Then 0,02 ml of investigated blood is added to HCl solution and is mixed for 5 min in hemometer at room temperature. The brown color of hematin chloride will develop. This color should be changed to standard color of hematin chloride, which is presented in hemometer, by water addition. Hemoglobin level is estimated by solution level in cylinder (1g% = 10g/l).

Laboratory work 2. *Measurment of hemoglobin concentration in the blood by spectrophotometer*

Description of the work. Then 0,02 ml of investigated blood should be added to 5 ml of transforming solution. It should stay for 10 min at room temperature. After that the investigated sample is insered in photometer KFK-3, and is compared to transforming solution as control

at optical distance (λ) of 520 nm. Students estimate hemoglobine concentration using calibration curve.

Laboratory work 3. *Calculation of erythrocyte count in Goryaev camera*

Description of the work. A rabbit blood should be dissolved 200 times by 3% solution of sodium chloride. The volume 0,02 ml of investigated blood is added to 4 ml of 3% sodium chloride solution. Mix and flood Goryaev camera by this solution.

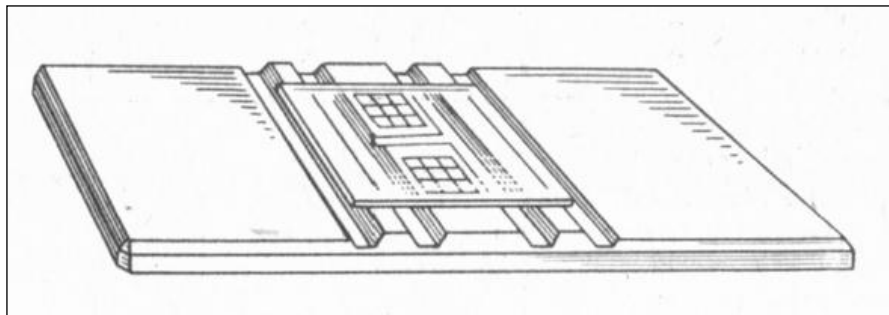


Fig. 19.2 – Goryaev camera for calculation of the blood cells

Under microscopat small magnification students calculate erythrocyte count in 5 big shade quadrants in diagonal direction.

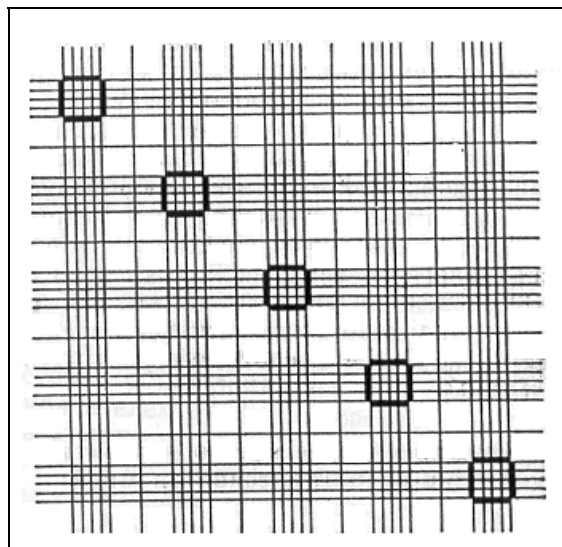


Fig. 19.3 – Scheeme of quadrants at Goryaev camera for calculation of the blood cells

The sum of calculated RBCs should be put to the formula:

$$X = \frac{A \times 200 \times 4000}{80} \times 10^6, \text{ where}$$

X – RBC count per 1 liter of the blood,
 A – sum of RBC in 5 big shade quadrants,
 200 – dissolving degree,
 4000 – total level of small quadrants in Goryaev camera.
 80 – sum of small quadrants in 5 big shade quadrants.

Laboratory work 4. Calculation of color index

Description of the work 4.

Color index (CI) = $(\text{Hb(g/l)} \times 3) / \text{first three figures of RBC count}$

Normal color index is 0,85 – 1,05

For example: Hb – 56 g/l
 RBC – $3,5 \times 10^{12}/\text{l}$

$$\text{CI} = \frac{56 \times 3}{350} = 0,48$$

Conclusion: hypochromic anemia

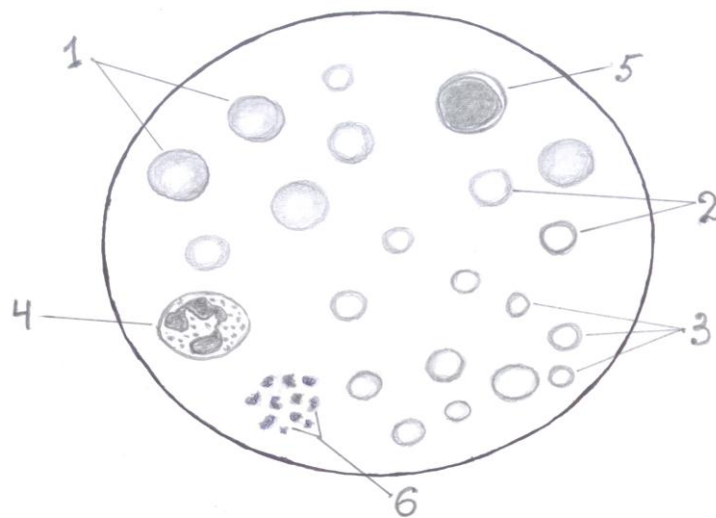


Fig. 19.4 – Blood film in iron deficiency anemia

- 1 – normochromic erythrocyte
- 2, 3 – erythrocyte hypochromic, microcyte
- 4 – polymorphnucleic leucocyte
- 5 – lymphocyte
- 6 – plattelets

Tasks:

Patient, 42 years old woman, arrives to the gynecological hospital after prolonged uterine bleeding (about 2-3 weeks).

Clinical findings: paleness, rapid pulse, uterine myoma (benign tumor).

Blood analysis: Hb – 68g/l, RBC – $2,8 \times 10^{12}/l$, Rf – 0,5%, erythrocyte sedimentation rate (ESR) – 8 mm/hr.

Blood sample: hypochromia of erythrocytes, anisocytosis, microcytosis, poikilocytosis, and single polychromatophils.

Biochemical analysis: serum Fe concentration 6 μ M.

What pathology has got the patient? Is it Fe-deficient anemia?

Make hematological conclusion.

2

A grey-haired male with blue eyes, 52 years old, is complaining of precordial pain, Dyspnoea upon stair climbing, and nausea. He is depressed and suffers from frequent coughs. The doctor observes icteric skin and eyes, ataxic walking, dysdiadochokinesis, and positive Babinski. Massive subcutaneous bleeding was found at the left hip. Laboratory tests revealed the following abnormal results: Lack of HCl in the gastric fluid during fasting and following a pentagastrin test. Haematology tests revealed large erythrocytes - many with nuclei. The red cell count was $1,4 \times 10^{12}$ per l. The haematocrit was 0.21, and the blood [haemoglobin] was 4 mM. The bleeding time was 90 min and the platelet count was 50×10^9 per l. The concentration of vitamin B₁₂ in serum was 90 ng per l. The total [bilirubin] in serum was 18 mg per l, and the rise mainly due to non-conjugated bilirubin. A test with radioactive B₁₂ was specific for lack of intrinsic factor production from the patient's parietal cells.

1. What was the cause of this severe pancytopenia (lack of all blood cell types)?

2. Calculate the oxygen capacity for haemoglobin.

3. Why did the patient develop leucopenia and thrombocytopenia? Was the lack of leucocytes and platelets of any consequences to the patient?

4. Does a severe, chronic anaemia trigger physiologic adaptations?

<u>Hemogramm № 1</u> Hemoglobin (Hgb) 95 g/l Erythrocytes (RBC) $3,6 \times 10^{12}/l$ Reticulocytes – 38 ‰ Hct 0,28 MCV -? MCH - ? MCHC-?	<u>Hemogramm № 2</u> Hemoglobin (Hgb) 88 g/l Erythrocytes (RBC) $3,1 \times 10^{12}/l$ Reticulocytes 0,4% Hct 0,48 MCV -? MCH - ? MCHC - ?
<u>Hemogramm № 3</u> Hemoglobin (Hgb) 68 g/l Erythrocytes (RBC) $3,8 \times 10^{12}/l$ Reticulocytes 1,2% Hct 0,38 MCV -? MCH - ? MCHC - ?	<u>Hemogramm № 4</u> Hemoglobin (Hgb) 120g/l Erythrocytes (RBC) $3,9 \times 10^{12}/l$ Reticulocytes 0,6% Hct 0,32 MCV -? MCH - ? MCHC - ?
<u>Hemogramm № 5</u> Hemoglobin (Hgb) 120 g/l Erythrocytes (RBC) $3,9 \times 10^{12}/l$ Reticulocytes – 8‰ Hct 0,38 MCV -? MCH - ? MCHC -?	<u>Hemogramm № 6</u> Hemoglobin (Hgb) 128 g/l Erythrocytes (RBC) $4,4 \times 10^{12}/l$ Reticulocytes 0,7% Hct 0,48 MCV -? MCH - ? MCHC - ?
<u>Hemogramm № 7</u> Hemoglobin (Hgb) 66 g/l Erythrocytes (RBC) $1,44 \times 10^{12}/l$ Reticulocytes 0,4% Hct 0,25 MCV -? MCH - ? MCHC - ?	<u>Hemogramm № 8</u> Hemoglobin (Hgb) 129 g/l Erythrocytes (RBC) $4,1 \times 10^{12}/l$ Reticulocytes 0,9% Hct 0,34 MCV -? MCH - ? MCHC - ?
<u>Hemogramm № 9</u> Hemoglobin (Hgb) 119 g/l	<u>Hemogramm № 10</u> Hemoglobin (Hgb) 54 g/l

Erythrocytes (RBC)	$4,1 \times 10^{12}/l$	Erythrocytes (RBC)	$1,8 \times 10^{12}/l$
Reticulocytes –	10‰	Reticulocytes	0,2%
Hct	0,42	Hct	0,28
MCV - ?		MCV - ?	
MCH - ?		MCH - ?	
MCHC - ?		MCHC - ?	
<u>Hemogramm № 11</u>		<u>Hemogramm № 12</u>	
Hemoglobin (Hgb)	180 g/l	Hemoglobin (Hgb)	120 g/l
Erythrocytes (RBC)	$6,3 \times 10^{12}/l$	Erythrocytes (RBC)	$4,25 \times 10^{12}/l$
Reticulocytes	5%	Reticulocytes	4‰
Hct	0,52	Hct	0,38
MCV - ?		MCV - ?	
MCH - ?		MCH - ?	
MCHC - ?		MCHC - ?	
<u>Hemogramm № 13</u>		<u>Hemogramm № 14</u>	
Hemoglobin (Hgb)	120 g/l	Hemoglobin (Hgb)	110 g/l
Erythrocytes (RBC)	$4,36 \times 10^{12}/l$	Erythrocytes (RBC)	$3,8 \times 10^{12}/l$
Reticulocytes	12‰	Reticulocytes	18‰
Hct	0,48	Hct	0,33
MCV - ?		MCV - ?	
MCH - ?		MCH - ?	
MCHC - ?		MCHC - ?	
<u>Hemogramm № 15</u>		<u>Hemogramm № 16</u>	
Hemoglobin (Hgb)	102 g/l	Hemoglobin (Hgb)	82 g/l
Erythrocytes (RBC)	$3,9 \times 10^{12} / l$	Erythrocytes (RBC)	$3,2 \times 10^{12}/l$
Reticulocytes	25 ‰	Reticulocytes	0%
Hct	0,35	Hct	0,32
MCV - ?		MCV - ?	
MCH - ?		MCH - ?	
MCHC - ?		MCHC - ?	

<u>Hemogramm № 17</u> Hemoglobin (Hgb) 40 g/l Erythrocytes (RBC) $0,797 \times 10^{12}/l$ Reticulocytes 3‰ Hct 0,20 MCV - ? MCH - ? MCHC - ?	<u>Hemogramm № 18</u> Hemoglobin (Hgb) 47 g/l Erythrocytes (RBC) $0,99 \times 10^{12}/l$ Reticulocytes 2‰ Hct 0,22 MCV - ? MCH - ? MCHC - ?
<u>Hemogramm № 19</u> Hemoglobin (Hgb) 80 g/l Erythrocytes (RBC) $2,8 \times 10^{12}/l$ Reticulocytes 18‰ Hct 0,26 MCV - ? MCH - ? MCHC - ?	<u>Hemogramm № 20</u> Hemoglobin (Hgb) 99 g/l Erythrocytes (RBC) $3,8 \times 10^{12}/l$ Reticulocytes 28‰ Hct 0,34 MCV - ? MCH - ? MCHC - ?
<u>Hemogramm № 21</u> Hemoglobin (Hgb) 130 g/l Erythrocytes (RBC) $4,2 \times 10^{12}/l$ Reticulocytes 1,2‰ Hct 0,24 MCV - ? MCH - ? MCHC - ?	<u>Hemogramm № 22</u> Hemoglobin (Hgb) 140 g/l Erythrocytes (RBC) $4,3 \times 10^{12}/l$ Reticulocytes 38‰ Hct 0,46 MCV - ? MCH - ? MCHC - ?
<u>Hemogramm № 23</u> Hemoglobin (Hgb) 95 g/l Erythrocytes (RBC) $3,6 \times 10^{12}/l$ Reticulocytes 1,8‰ Hct 0,35 MCV - ? MCH - ? MCHC - ?	<u>Hemogramm № 24</u> Hemoglobin (Hgb) 88 g/l Erythrocytes (RBC) $3,1 \times 10^{12}/l$ Reticulocytes 0,4‰ Hct 0,30 MCV - ? MCH - ? MCHC - ?

<u>Hemogramm № 25</u> Hemoglobin (Hgb) 68 g/l Erythrocytes (RBC) $3,8 \times 10^{12}/l$ Reticulocytes 1,2% Hct 0,28 MCV -? MCH - ? MCHC - ?	<u>Hemogramm № 26</u> Hemoglobin (Hgb) 120 g/l Erythrocytes (RBC) $3,9 \times 10^{12}/l$ Reticulocytes 0,1% Hct 0,38 MCV -? MCH - ? MCHC - ?
<u>Hemogramm № 27</u> Hemoglobin (Hgb) 185 g/l Erythrocytes (RBC) $7,2 \times 10^{12}/l$ Reticulocytes 2,6% ESR 10 mm/h Hct 0,48 MCV -? MCH - ? MCHC-?	<u>Hemogramm № 28</u> Hemoglobin (Hgb) 180 g/l Erythrocytes (RBC) $5,8 \times 10^{12}/l$ Reticulocytes 0,5% ESR 1 mm/h Hct 0,68 MCV -? MCH - ? MCHC - ?
<u>Hemogramm № 29</u> Hemoglobin (Hgb) 80 g/l Erythrocytes (RBC) $2,9 \times 10^{12}/l$ Reticulocytes 0,3% Hct 0,38 MCV -? MCH - ? MCHC - ?	<u>Hemogramm № 30</u> Hemoglobin (Hgb) 60 g/l Erythrocytes (RBC) $2,0 \times 10^{12}/l$ Reticulocytes 0% Hct 0,22 MCV -? MCH - ? MCHC - ?
<u>Hemogramm № 31</u> Hemoglobin (Hgb) 150 g/l Erythrocytes (RBC) $1,5 \times 10^{12}/l$ Reticulocytes – 40% ESR - Hct 0,28 MCV -? MCH - ? MCHC - ?	<u>Hemogramm № 32</u> Hemoglobin (Hgb) 60 g/l Erythrocytes (RBC) $0,8 \times 10^{12}/l$ ESR 80 mm/h Reticulocytes 0,1% Hct 0,28 MCV -? MCH - ? MCHC - ?
<u>Hemogramm № 33</u>	<u>Hemogramm № 34</u>

Hemoglobin (Hgb)	135 g/L	Hemoglobin (Hgb)	110 g/L
Erythrocytes (RBC)	$3,8 \times 10^{12}/l$	Erythrocytes (RBC)	$3,0 \times 10^{12}/l$
Reticulocytes	0,4%	Reticulocytes	0,3%
Hct	0,28	Hct	0,32
MCV -?		MCV -?	
MCH - ?		MCH - ?	
MCHC - ?		MCHC - ?	
<u>Hemogramm № 35</u>		<u>Hemogramm № 36</u>	
Hemoglobin (Hgb)	70 g/l	Hemoglobin (Hgb)	80 g/l
Erythrocytes (RBC)	$2.5 \times 10^{12}/l$	Erythrocytes (RBC)	$3,4 \times 10^{12}/l$
Reticulocytes	0,1%	Reticulocytes	0%
Hct	0,28	Hct	0,28
MCV -?		MCV -?	
MCH - ?		MCH - ?	
MCHC-?		MCHC - ?	
<u>Hemogramm № 37</u>		<u>Hemogramm № 38</u>	
Hemoglobin (Hgb)	58 g/l	Hemoglobin (Hgb)	62 g/l
Erythrocytes (RBC)	$3,0 \times 10^{12}/l$	Erythrocytes (RBC)	$3,9 \times 10^{12}/l$
Reticulocytes –	18‰	Reticulocytes –	30‰
Hct	0,28	Hct	0,28
MCV -?		MCV -?	
MCH - ?		MCH - ?	
MCHC - ?		MCHC - ?	
<u>Hemogramm № 39</u>		<u>Hemogramm № 40</u>	
Hemoglobin (Hgb)	90 g/l	Hemoglobin (Hgb)	100 g/l
Erythrocytes (RBC)	$3,6 \times 10^{12}/l$	Erythrocytes (RBC)	$3,6 \times 10^{12}/l$
Reticulocytes	34‰	Reticulocytes	55‰
Hct	0,28	Hct	0,28
MCV -?		MCV -?	
MCH - ?		MCH - ?	
MCHC - ?		MCHC - ?	

<u>Hemogramm № 41</u> Hemoglobin (Hgb) 110 g/l Erythrocytes (RBC) $3.2 \times 10^{12}/l$ Reticulocytes 0,4% Hct 0,28 MCV - ? MCH - ? MCHC - ?	<u>Hemogramm № 42</u> Hemoglobin (Hgb) 70 g/l Erythrocytes (RBC) $2,1 \times 10^{12}/l$ Reticulocytes 0,1% Hct 0,28 MCV - ? MCH - ? MCHC - ?
<u>Hemogramm № 43</u> Hemoglobin (Hgb) 90 g/l Erythrocytes (RBC) $3,4 \times 10^{12}/l$ Reticulocytes 3,6% Hct 0,28 MCV - ? MCH - ? MCHC - ?	<u>Hemogramm № 44</u> Hemoglobin (Hgb) 80 g/l Erythrocytes (RBC) $2,7 \times 10^{12}/l$ Reticulocytes 0,2% Hct 0,28 MCV - ? MCH - ? MCHC - ?
<u>Hemogramm № 45</u> Hemoglobin (Hgb) 62 g/l Erythrocytes (RBC) $3,5 \times 10^{12}/l$ Reticulocytes 25% Hct 0,28 MCV - ? MCH - ? MCHC - ?	<u>Hemogramm № 46</u> Hemoglobin (Hgb) 100 g/l Erythrocytes (RBC) $3,4 \times 10^{12}/l$ Reticulocytes 0,2%
<u>Hemogramm № 47</u> Hemoglobin (Hgb) 125 g/l Erythrocytes (RBC) $7,3 \times 10^{12}/l$ Reticulocytes 48‰ Hct 0,28 MCV - ? MCH - ? MCHC - ?	<u>Hemogramm № 48</u> Hemoglobin (Hgb) 45 g/l Erythrocytes (RBC) $1,4 \times 10^{12}/l$ Reticulocytes 10‰ Hct 0,28 MCV - ? MCH - ? MCHC - ?
<u>Hemogramm № 49</u> Hemoglobin (Hgb) 125 g/l	<u>Hemogramm № 50</u> Hemoglobin (Hgb) 120 g/l

Erythrocytes (RBC)	4,2x10 ¹² /l	Erythrocytes (RBC)	4,2x10 ¹² /l
Reticulocytes	25%	Reticulocytes	5%
Hct	0,28	Hct	0,28
MCV -?		MCV -?	
MCH - ?		MCH - ?	
MCHC - ?		MCHC - ?	
<u>Hemogramm № 51</u>		<u>Hemogramm № 52</u>	
Hemoglobin (Hgb)	60 g/l	Hemoglobin (Hgb)	102 g/l
Erythrocytes (RBC)	1,3x10 ¹² /l	Erythrocytes (RBC)	3,6x10 ¹² /l
Reticulocytes	1,8%	Reticulocytes	1,1%
Hct	0,28	Hct	0,28
MCV -?		MCV -?	
MCH - ?		MCH - ?	
MCHC - ?		MCHC - ?	
<u>Hemogramm № 53</u>		<u>Hemogramm № 54</u>	
Hemoglobin (Hgb)	119 g/l	Hemoglobin (Hgb)	50g/l
Erythrocytes (RBC)	4,1x10 ¹² /l	Erythrocytes (RBC)	1,0x10 ¹² /l
Reticulocytes	18‰	Reticulocytes	0,2%
Hct	0,28	Hct	0,28
MCV -?		MCV -?	
MCH - ?		MCH - ?	
MCHC - ?		MCHC - ?	
<u>Hemogramm № 55</u>		<u>Hemogramm № 56</u>	
Hemoglobin (Hgb)	170 g/l	Hemoglobin (Hgb)	110 g/l
Erythrocytes (RBC)	6,5x10 ¹² /l	Erythrocytes (RBC)	3,6x10 ¹² /l
Reticulocytes	4,5%	Reticulocytes –	20‰
Hct	0,28		
MCV -?			
MCH - ?			
MCHC - ?			
<u>Hemogramm № 57</u>		<u>Hemogramm № 58</u>	
Hemoglobin (Hgb)	120 g/l	Hemoglobin (Hgb)	100 g/l
Erythrocytes (RBC)	4,36x10 ¹² /l	Erythrocytes (RBC)	3,1x10 ¹² /l

Reticulocytes	8‰	Reticulocytes	25‰
Hct	0,28	Hct	0,28
MCV -?		MCV -?	
MCH - ?		MCH - ?	
MCHC -?		MCHC - ?	
<u>Hemogramm № 59</u>		<u>Hemogramm № 60</u>	
Hemoglobin (Hgb)	45 g/l	Hemoglobin (Hgb)	44 g/l
Erythrocytes (RBC)	$0,84 \times 10^{12}/l$	Erythrocytes (RBC)	$1,2 \times 10^{12}/l$
Reticulocytes	0‰	Reticulocytes	1‰
Hct	0,28	Hct	0,28
MCV -?		MCV -?	
MCH - ?		MCH - ?	
MCHC - ?		MCHC-?	
<u>Hemogramm № 61</u>		<u>Hemogramm № 62</u>	
Hemoglobin (Hgb)	65 g/l	Hemoglobin (Hgb)	90 g/l
Erythrocytes (RBC)	$2,4 \times 10^{12}/l$	Erythrocytes (RBC)	$3,4 \times 10^{12}/l$
Reticulocytes	15%	Reticulocytes –	8‰
Hct	0,28	Hct	0,28
MCV -?		MCV -?	
MCH - ?		MCH - ?	
MCHC - ?		MCHC-?	
<u>Hemogramm № 63</u>		<u>Hemogramm № 64</u>	
Hemoglobin (Hgb)	85 g/l	Hemoglobin (Hgb)	80 g/l
Erythrocytes (RBC)	$3,0 \times 10^{12}/l$	Erythrocytes (RBC)	$2,7 \times 10^{12}/l$
Reticulocytes	1,0%	Reticulocytes	0,3%
Hct	0,28	Hct	0,28
MCV -?		MCV -?	
MCH - ?		MCH - ?	
MCHC - ?		MCHC - ?	

<u>Hemogramm № 65</u> Hemoglobin (Hgb) 68 g/l Erythrocytes (RBC) $3,8 \times 10^{12}/l$ Reticulocytes 1,2% Hct 0,28 MCV -? MCH - ? MCHC - ?	<u>Hemogramm № 66</u> Hemoglobin (Hgb) 100 g/l Erythrocytes (RBC) $3,4 \times 10^{12}/l$ Reticulocytes 0,2% Hct 0,28 MCV -? MCH - ? MCHC - ?
<u>Hemogramm № 67</u> Hemoglobin (Hgb) 110 g/l Erythrocytes (RBC) $1,2 \times 10^{12}/l$ Reticulocytes 3,8% Hct 0,28 MCV -? MCH - ? MCHC - ?	<u>Hemogramm № 68</u> Hemoglobin (Hgb) 90 g/l Erythrocytes (RBC) $3,8 \times 10^{12}/l$ Reticulocytes 0,3% Hct 0,28 MCV -? MCH - ? MCHC - ?
<u>Hemogramm № 69</u> Hemoglobin (Hgb) 56 g/l Erythrocytes (RBC) $1,3 \times 10^{12}/l$ Reticulocytes 0% ESR 52 mm/h Hct 0,28 MCV -? MCH - ? MCHC - ?	<u>Hemogramm № 70</u> Hemoglobin (Hgb) 80 g/l Erythrocytes (RBC) $2,5 \times 10^{12}/l$ Reticulocytes 2% Hct 0,28 MCV -? MCH - ? HC - ?
<u>Hemogramm № 71</u> Hemoglobin (Hgb) 48 g/l Erythrocytes (RBC) $1,2 \times 10^{12}/l$ Reticulocytes 0,3% Hct 0,28 MCV -? MCH - ? MCHC - ?	<u>Hemogramm № 72</u> Hemoglobin (Hgb) 170 g/l Erythrocytes (RBC) $4,0 \times 10^{12}/l$ Reticulocytes 1,0% Hct 0,28 MCV -? MCH - ? MCHC - ?
<u>Hemogramm № 73</u> Erythrocytes (RBC) $3,0 \times 10^{12}/l$	<u>Hemogramm № 74</u> Erythrocytes (RBC) $3,7 \times 10^{12}/l$

Hemoglobin (Hgb)	100 g/l	Hemoglobin (Hgb)	95 g/l
Reticulocytes	0,6%	Reticulocytes	3%
Hct	0,28	Hct	0,28
MCV -?		MCV -?	
MCH - ?		MCH - ?	
MCHC - ?		MCHC - ?	

LITERATURE:

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