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**Studies on the European Hare. XIV. Some Physiological Characteristics of Blood**

[With 2 Figs. &amp; 3 Tables]

Hemoglobin content, erythrocyte and leucocyte counts, and blood sedimentation has been studied in European hare ( $n = 54$ ) from Poznań Province (Poland). It was found that there is statistically significant difference between males and females in erythrocyte count. Average hemoglobin content, leucocyte count and sedimentation rate show no such differences between both sexes. Erythrocyte and leucocyte numbers decreases after animals death. Values of erythrocyte count, leucocyte count and hemoglobin content found, are higher than presented by another authors.

Published data on blood picture of the European hare are very scarce and the methods described in these papers seem doubtful. Koržujev & Goldfarb (1954) give the number of erythrocytes and hemoglobin content based on studying one specimen. Pujman (1948, 1955) presents results based on larger series of animals (15 specimens) including erythrocyte and leucocyte counts and hemoglobin content. The blood to be studied was taken from shot hares from the bullet wound or from the chest. However, it is not known if there are any changes after the animals death and what character they may have. The existence of sex and age differences is not determined and opinions of different authors (Malassez, 1872; Sjöwall, 1936), concerning other animals, disagree and often are contradictory.

The range of blood sedimentation test is usually not included in publications, even for the laboratory animals. It is only known (Kudriavcev, 1951) that it is low in healthy farm animals. The purpose of this study was to determine norms of erythrocyte and leucocyte counts, blood hemoglobin content and the variance of one of physical blood characteristics — blood sedimentation reaction in the European hare. These determinations were to be made on suitably large series of animals considering their sex and age.

## MATERIAL AND METHODS

This study was carried out on hunting grounds of Polish Hunting Association Research Station at Czemiń near Poznań. The European hares to be studied were caught in nets and brought in cages. The lapse of time between catching the hare and collecting the sample was from 7 to 24 hours. Before taking blood samples the hares were weighed and their age determined using the method of Stroh (1931). The blood for studies was collected from the marginal vein of ear after warming it up by brushing with a cotton-wool tampon and clipping hair in the place of cutting. Total of 25 females and 29 males were studied during two expeditions between December 11 and December 22 and between January 18 and January 26. In several cases blood was taken from live and then from the same shot specimen to determine whether there are any changes in blood after the death of animal.

Red and white blood cells were counted by classical methods using Potain mixer and Thom chamber. Hayem and Türk reagents were used as the diluents. Hemoglobin content was determined in Sahli hemoglobin-meter ("Oka-Fabrikat") using 0.1 n HCl. Because of big innacuracy of this method the results given are approximate and require checking with more precise instrument. Blood sedimentation was determined by a micromethod using Pančenkov pipettes and sodium citrate as anticoagulant.

## NUMBER OF ERYTHROCYTES

The mean erythrocytes count in 1 mm<sup>3</sup> was calculated separately for December and January series. As there was no statistically significant

Table 1.

Erythrocyte and leucocyte count, hemoglobin and blood sedimentation in European hare.

|                                           | Number of animals | Mean  | S. D. | S. E. | Range of variation |       |
|-------------------------------------------|-------------------|-------|-------|-------|--------------------|-------|
|                                           |                   |       |       |       | Min.               | Max.  |
| Hemoglobin %<br>(Sahli)                   | ♂♂ 54<br>♀♀       | 107.7 | 6.6   | 0.9   | 95                 | 124   |
| Erythrocyte count<br>ml./mm <sup>3</sup>  | ♂♂ 29             | 9.53  | 0.7   | 0.13  | 7.72               | 11.88 |
|                                           | ♀♀ 25             | 8.69  | 0.9   | 0.15  | 5.56               | 9.60  |
| Leucocyte count<br>thous./mm <sup>3</sup> | ♂♂ 54<br>♀♀       | 5.29  | 1.41  | 0.17  | 2.50               | 7.90  |
| Blood sedimentation                       | ♂♂ 54<br>♀♀       | 2.26  | 1.22  | 0.16  | 1                  | 5     |

differences between the two, results of both series were pooled and combined mean erythrocyte number was calculated. Mean erythrocyte count of males and females was calculated separately. The difference between males and females is statistically significant and amounts to roughly one million erythrocytes in favour of males (Tab. 1 and Fig. 1).



Age differences were not found. However, their existence can not be excluded as the age was only approximately determined (young, old).

#### HEMOGLOBIN CONTENT

The average hemoglobin content (Tab. 1) is the same for females and males. It was calculated in the analogous way to mean erythrocyte number. The results of December and January series were pooled (there was no significant difference) and average hemoglobin content was computed for males and females. The difference between males and

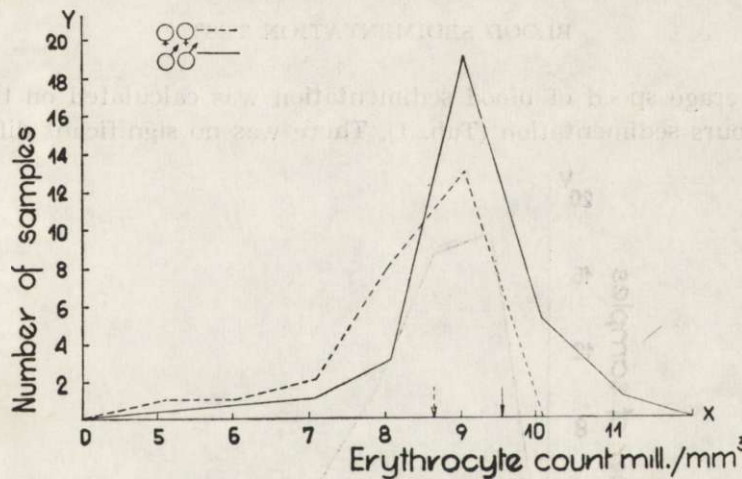


Fig. 1. Frequency of given erythrocyte count in the European hare.

females is not significant. To compare these results with data published by others Sahli per cents were calculated into absolute units assuming (according to the booklet) 100% = 16g% (Tab. 2). Absolute hemoglobin index representing the amount of hemoglobin in one erythrocyte was calculated after the formula:

$$\frac{\text{hemoglobin (g\%)} \times 10}{\text{erythrocyte count (mill.)}} = \gamma\gamma \text{ (g} \times 10^{-12}\text{)}$$

Between the mean hemoglobin content in one erythrocyte of males and females there is a difference of 1.74  $\gamma\gamma$  in favour of females.

#### LEUCOCYTE NUMBER

Males and females from both series were pooled to calculate the mean leucocyte number. There were no significant differences between sexes or between series. The results of samples show more variance than the erythrocyte count. It is related to the immunological functions of leucocytes.

**Table 2.**

Comparison of hemoglobin content, erythrocyte and leucocyte counts quoted by different authors.

| Author          | Number of animals | Hemoglobin |           | Erythrocytes in mill./mm <sup>3</sup> | Leucocytes in thous./mm <sup>3</sup> |
|-----------------|-------------------|------------|-----------|---------------------------------------|--------------------------------------|
|                 |                   | % Sahli    | g %       |                                       |                                      |
| Koržujev (1964) | 1                 |            | 16.5      | 7.1                                   | —                                    |
| Pujman (1948)   | 15                | 99—100     | 15.8—17.6 | 5.14—7.36                             | 2.90—5.43                            |
| Present data    | 54                | 95—124     | 15.2—19.8 | 5.56—11.88                            | 2.50—7.90                            |

#### BLOOD SEDIMENTATION TEST

The average speed of blood sedimentation was calculated on the base of two hours sedimentation (Tab. 1). There was no significant difference

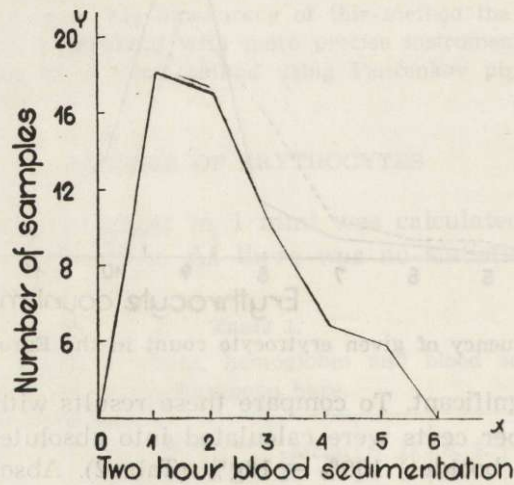


Fig. 2. Frequency of given blood sedimentation.

between males and females. The distribution of blood sedimentation in given population is normal (Fig. 2).

#### DISCUSSION

1. The results indicate that the erythrocyte count, leucocyte count and hemoglobin content in the hare are higher than given in previous descriptions (Tab. 2). In the work of Pujman (1948) the method of collecting blood after the animal's death deserves to be mentioned. The comparative studies of blood taken from live animals (from ear or heart)



and from the same animals shot (from the chest) indicate that the erythrocyte and leucocyte number decreases after animals death (Tab. 3). Numerically, the differences are not identical, what would indicate the influence of many factors (for example: shotgun wound spot, blood loss, speed of blocking all physiological processes) not known as yet in any detail. Thus one can draw conclusions from shot material only when the number of animals was very big.

Table 3.

Comparison of erythrocyte and leucocyte counts for live and shot hares.

| Erythrocytes in mill./mm <sup>3</sup> |              | Leucocytes in thous./mm <sup>3</sup> |              |
|---------------------------------------|--------------|--------------------------------------|--------------|
| live animals                          | shot animals | live animals                         | shot animals |
| 10.20                                 | 8.20         | 2.7                                  | 0.6          |
| 10.80                                 | 10.10        | 2.4                                  | 2.2          |
| 9.65                                  | 8.57         | 7.7                                  | 4.1          |
| 10.07                                 | 9.90         | 8.6                                  | 4.1          |
| 11.00                                 | 9.90         | 8.1                                  | 5.9          |
| 9.97                                  | 8.12         | 7.8                                  | 5.9          |
| 11.35                                 | 8.57         | 7.3                                  | 4.1          |

2. The dependency of erythrocyte count on sex is not given by Pujman (1948). This author has not found any differences between males and females.

3. Presented for the first time range of blood sedimentation of the European hare confirms opinions (Kudriavcev, 1954) that blood sedimentation in healthy animals is low.

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Received, January 11, 1966.

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#### BADANIA NAD ZAJĄCEM SZARAKIEM. XIV. NIEKTÓRE WSKAŹNIKI FIZJOLOGICZNE KRWI

##### Streszczenie

Badano zawartość hemoglobiny, liczbę erytrocytów i leukocytów oraz opad krwi zająca szaraka ( $n = 54$ ) z okolic Poznania. Nie stwierdzono istotnych statystycznie różnic w zawartości hemoglobiny, ilości leukocytów i opadzie u samców i samic. Różnice w ilości erytrocytów były istotne. Porównując wskaźniki krwi u zwierząt żywych i martwych, stwierdzono spadek liczby erytrocytów i leukocytów po śmierci zająca. Uzyskane wartości wskaźników krwi zająca szaraka są wyższe niż dotychczas podawane w literaturze.