

AN INVESTIGATION INTO BIOCHEMICAL PROFILE OF BLOOD HARVESTED FROM RABBITS (BELGIAN GIANT BREED) AND HARES (*LEPUS EUROPAEUS PALLAS*)

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Abstract

The purpose of this study was to establish the physiological status of rabbits (Belgian Giant breed) and hares (*Lepus Europaeus Pallas*) by determining the biochemical profile. To establish the biochemical profile among individuals in the study were determined major metabolic indicators (protein and mineral profile). With automatic biochemical analyzer Accent 200, were determined the main indicators of metabolic profile: total protein, albumin, uric acid, urea, calcium, magnesium and phosphorus. Mean values of the determined biochemical parameters varied for rabbits and hares. After applying statistical analysis has revealed insignificant differences between the sexes at the level of the same species. Following the results of measurements performed in this study were observed normal aspects of biochemical parameters in rabbits from both species (rabbit Belgian Giant and hares *Lepus Europaeus Pallas*), they were clinically healthy.

Key words: total protein, albumin, urea, calcium, magnesium

INTRODUCTION

Plasma protein concentrations reflect a balance between capillary filtration and return the lymph tissue. This balance depends on the colloidal osmotic pressure and circulation dynamics, namely the tendency of blood to draw fluid from the tissues due to colloid osmotic pressure and hydrostatic depression opposite of blood which tends to force fluid into the tissue spaces [2]. The protein concentration in the blood plasma at one time is dependent on hormonal balance, nutritional status, hydric balance, as well as other factors that affect health. Protein concentration of plasma influence the metabolism of protein; as the concentration of albumin and gamma-globulin increases, the rate of degradation also increases [1].

Water losses (hemoconcentration) due to dehydration increases the total plasma protein concentration. In this case will increase both albumin and globulins, so albumin/globulin ratio will be one normal [5].

In the proper functioning of all organisms electrolytes importance is considerable. In

general, severe diseases are accompanied by changes in the balance mineral, which must be taken into account for correction. The role of electrolytes is multiple. They intervene as agents metabolism, constituents of living matter and are the factors responsible of physicochemical equilibrium essential to the body [4]. Some electrolytes plays a major structural role (Ca, P), others are involved in various enzymatic processes (the case of P and K ions). Ions of Na, K, Ca, Mg plays an essential role in the phenomenon of cell polarization and depolarisation, allow the conductivity of the nerve and muscle contraction which depend on the blood circulation and movement [3].

MATERIAL AND METHODS

This paper is part of a broader study aimed at comparative characterization of the rabbits (Belgian Giant breed) and hares (*Lepus Europaeus Pallas*) meat and physiological status. To be able to realize the biochemical determinations, biological material was formed by 85 individuals: 49 hares (24 males and 25 females) and 36 rabbits (5 males and 31 females) belonging to Belgian Giant breed. Hares which were collected (during hunting seasons), came from Iași County hunting

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funds (Coarnele Caprei, Ciurea, Cotu Morii). Both species was studied at the age of reproductive maturity, adults (11-12 months). The rabbits (Belgian Giant breed) have had an average body weight of 11.5 kg and the hares have had an average weight of 5.6 kg. Blood collection for biochemical determinations was performed on live hare caught in the net, fed and accommodated in the dark for not being stressed. For rabbits Belgian Giant breed, blood sampling was performed in the same way, with except of darkness. Blood sampling for biochemical profile was harvested in vacutainers without anticoagulant (with red cap). At hares blood was collected from the auricular and ulnar veins. At rabbits blood collection was performed from auricular veins. The biochemical parameters were determined using ACCENT 200, device which is an biochemical system designed for in vitro quantitative determination of serum, plasma, urine or cerebrospinal fluid. The method of calorimetric determination of light transmission through the using a solution for detecting the concentration of a substance in solution. The principle is based on changing the wavelength known through a sample and

measuring the amount of light energy that is transmitted. The results obtained were statistically interpreted. The first stage occurred usual statistical estimators calculation - arithmetic mean (\bar{X}), standard deviation (s), variance (S^2) and coefficient of variation (V%)-calculated using the software algorithm. To test the statistical significance of differences between the studied characters, we used ANOVA Single Factor algorithm included in Microsoft Excel software package.

RESULTS AND DISCUSSIONS

Results about protein profile

For rabbits belonging to Belgian Giant (Flemish Giant) breed, were obtained the highest values regarding the quantity of the total proteins, compared with values determined for hares. For albumin the highest quantity was determined for male hares (39.85 g/dL), followed by the one obtained for male rabbits (32.85 g/dL) and by female hares (31.56 g/dL).

The average quantities and usual statistic estimators are found in table 1.

Table 1 The protein profile in rabbits (Belgian Giant breed) and hares (*Lepus Europaeus Pallas*)

The protein profile		$\bar{X} \pm s \bar{x}$	V%	S^2	Minimum	Maximum
Female hares <i>Lepus Europaeus</i>	Total protein (g/dL)	59.77±17.31	6.88	26.00	19.12	64.40
	Albumin (g/dL)	31.56±7.54	11.67	5.50	6.30	43.90
	Uric acid (mg/dL)	1.60±0.65	74.97	3.80	0.32	5.87
	Urea (mg/dL)	9.06±5.58	52.24	20.50	7.09	24.70
Male hares <i>Lepus Europaeus</i>	Total protein (g/dL)	47.48±5.48	19.38	24.73	8.60	59.40
	Albumin (g/dL)	39.85±8.93	14.73	21.34	16.37	56.01
	Uric acid (mg/dL)	3.55±0.86	72.89	6.68	0.48	6.98
	Urea (mg/dL)	44.84±6.81	42.93	30.57	12.50	54.70
Female rabbits Belgian Giant	Total protein (g/dL)	63.33±0.65	5.79	3.80	51.10	73.90
	Albumin (g/dL)	27.56±7.54	5.67	51.50	18.30	33.90
	Uric acid (mg/dL)	1.29±4.17	50.67	13.79	0.730	12.63
	Urea (mg/dL)	11.73±0.02	6.38	3.07	7.67	16.89
Male rabbits Belgian Giant	Total protein (g/dL)	64.12±0.12	3.77	0.04	53.10	75.50
	Albumin (g/dL)	32.85±6.7	4.78	41.54	18.57	46.41
	Uric acid (mg/dL)	2.77±0.03	16.53	5.02	0.75	3.80
	Urea (mg/dL)	14.8±1.53	7.54	7.46	11.31	18.14

The average amount of uric acid had the highest values for male hares (3.5 mg/dL), followed by male rabbits (2.8 mg/dL), comparative with female hares at which registered lower values (1.6 mg/dL). The lowest average values, 1.3 mg/dL, were determined for females belonging to the Belgian Giant breed.

For urea, the highest average values were obtained for male hares (23.8 mg/dL), followed by the one obtained for male rabbits (14.8 mg/dL), the one for female rabbits (11.7 mg/dL) and the lowest values for female hares (9.1 mg/dL).

From measurements made on the protein profile for rabbits and hares, was noticed a higher concentration of total protein at male rabbits, namely 64.12 g/dL, and the highest value for albumin was revealed at male hares of 39.85 g/dL (table 1).

The coefficient of variation calculated for rabbits was lower than 10%, expressing a very homogeneous population. For male rabbits the value was 3.77% for total protein, and 4.78% for albumin characterizing a very homogeneous population (table 1). For females, the value of the coefficient of variation was slightly higher, 5.8% for total protein and 3.77% for albumin. The coefficient of variation calculated for hares

registered values that have not overcome the critical threshold of 20%, corresponding to a relatively homogeneous population, both females and males, regarding the content of total protein and albumin (14.7% for males). Exception makes the coefficient calculated for female hares, on total protein level, showing in this case a percentage of 6.88%, expressing thus a very homogeneous population (table 1).

For rabbits, on urea level, was calculated a coefficient of variation that was placed under the threshold of 10% (females and males) symbolizing a very homogeneous population. For male rabbits the coefficient of variation had the value of 16.53% for uric acid, showing a relatively homogeneous population. For female rabbits the coefficient of variation exceeded the threshold of 20% for uric acid, in this case showing an inhomogeneous population.

The coefficient of variation calculated for urea and uric acid, for hares exceeded the threshold of 20%, which shows a inhomogeneous population (table 1).

Regarding the statistical significance of the differences, by applying the analysis of variance test, were obtained insignificant differences regarding the protein profile, both for rabbits and hares, females and males (table 2).

Table 2 The statistical significance of differences in protein profiles for rabbits and hares by gender

Proteic profile		The statistical significance of differences
Male vs female hares <i>Lepus Europaeus</i>	Total protein (g/dL)	$\hat{F}=2.082$; $F_{5\%}(1;16)=4.494$; $\hat{F} < F_{5\%}$ n.s.
	Albumin (g/dL)	$\hat{F}=0.387$; $F_{5\%}(1;15)=4.543$; $\hat{F} < F_{5\%}$ n.s.
	Uric acid (mg/dL)	$\hat{F}=0.769$; $F_{5\%}(1;16)=4.493$; $\hat{F} < F_{5\%}$ n.s.
	Urea (mg/dL)	$\hat{F}=2.145$; $F_{5\%}(1;15)=4.543$; $\hat{F} < F_{5\%}$ n.s.
Male vs female rabbits Belgian Giant	Total protein (g/dL)	$\hat{F}=2.286$; $F_{5\%}(1;11)=4.844$; $\hat{F} < F_{5\%}$ n.s.
	Albumin (g/dL)	$\hat{F}=1.339$; $F_{5\%}(1;16)=4.494$; $\hat{F} < F_{5\%}$ n.s.
	Uric acid (mg/dL)	$\hat{F}=0.573$; $F_{5\%}(1;9)=5.117$; $\hat{F} < F_{5\%}$ n.s.
	Urea (mg/dL)	$\hat{F}=1.047$; $F_{5\%}(1;9)=5.117$; $\hat{F} < F_{5\%}$ n.s.

Results about mineral profile

From mineral profile measured in serum from rabbits, were obtained the highest values of calcium at female hares, respectively 52.7 g/dL, as against males, in which was registered an average value of

39.95 g/dL. Calcium values determined for rabbits belonging to the Belgian Giant breed were lower than those determined for hares, 41.9±0.98 mg/dL for females and 34.5±0.145 mg/dL for males (table 3).

For magnesium the highest value was obtained for male rabbits (9.33 g/dL), followed by male hares (8.37 g/dL). The lowest value of the magnesium content was

found on female hares (4.97 g/dL), followed by the one established for female rabbits (8.25 mg/dL) (table 3).

Table 3 The mineral profile in rabbits (Belgian Giant breed) and hares (*Lepus Europaeus Pallas*)

Mineral Profile		$\bar{X} \pm s \bar{x}$	V%	S ²	Minimum	Maximum
Female hares <i>Lepus Europaeus</i>	Ca (mg/dL)	52.7±9.58	34.01	3.195	12.47	66.76
	Mg (mg/dL)	4.97±0.65	29.99	3.89	1.28	7.02
	P (mg/dL)	19.43±1.915	38.11	32.99	10.7	29.14
Male hares <i>Lepus Europaeus</i>	Ca (mg/dL)	39.95±8.81	25.63	83.37	12.17	69.3
	Mg (mg/dL)	8.37±7.7	29.01	52.17	5.49	31.3
	P (mg/dL)	18.15±2.1	39.05	35.52	3.4	24.4
Female rabbits Belgian Giant	Ca (mg/dL)	41.9±0.98	24.71	8.645	9.4	46.7
	Mg (mg/dL)	8.25±51.17	26.48	47.36	4.3	12.64
	P (mg/dL)	16.81±0.937	38.93	7.032	12.1	27.3
Male rabbits Belgian Giant	Ca (mg/dL)	34.5±0.145	2.52	0.063	9.7	45.2
	Mg (mg/dL)	9.33±1.201	1.70	4.333	7.25	12.4
	P (mg/dL)	19.5±0.251	5.13	0.19	8.42	29.35

Ca-calcium; Mg-magnesium; P- phosphor

Concerning the phosphor level, the highest content was met on male rabbits (19.5 g/dL), followed by the one determined for female hares (19.43 g/dL) and male hares (18.15 g/dL), which registered similar values. Lower values of phosphor level were determined for female rabbits, with an average of 16.81 mg/dL. The coefficient of variation calculated for the mineral profile on hares, had values over 20%, which shows an inhomogeneous population regarding the biochemical parameter taken in study. The coefficient of variation calculated for male rabbits, regarding the results obtained on

mineral profile of serum harvested from these, registered minimum values (under 10%), for calcium, magnesium and phosphor which symbolizes a very homogeneous population (table 3).

For female rabbits, the coefficient of variation exceeded the threshold of 20% reflecting an inhomogeneous population concerning the mineral profile (table 3).

By applying the analysis of variance test on the mineral profile measured for both females and males, rabbits and hares, were obtained insignificant differences between genders (table 4).

Table 4 Statistical significance of differences in mineral profile for rabbits and hares by gender

Mineral Profile		The statistical significance of the differences
Male vs female hares <i>Lepus Europaeus</i>	Ca	$\hat{F} = 1.339$; $F_{5\%}(1;16) = 4.494$; $\hat{F} < F_{5\%} = n.s.$
	Mg	$\hat{F} = 1.018$; $F_{5\%}(1;16) = 4.494$; $\hat{F} < F_{5\%} = n.s.$
	P	$\hat{F} = 1.711$; $F_{5\%}(1;15) = 4.543$; $\hat{F} < F_{5\%} = n.s.$
Male vs female rabbits Belgian Giant	Ca	$\hat{F} = 1.213$; $F_{5\%}(1;10) = 4.964$; $\hat{F} < F_{5\%} = n.s.$
	Mg	$\hat{F} = 1.127$; $F_{5\%}(1;9) = 5.117$; $\hat{F} < F_{5\%} = n.s.$
	P	$\hat{F} = 1.536$; $F_{5\%}(1;15) = 4.543$; $\hat{F} < F_{5\%} = n.s.$

Ca-calcium; Mg- magnesium; P- phosphor

It is observed an increasing tendency of calcium in serum content for hares, in comparison to rabbits and a decreasing tendency for phosphor and magnesium, which may be influenced by feed ratio and stress factors.

In the scientific paperworks, in numerous studies, there is found insignificant differences between genders for rabbits of different breeds and the values were similar to the ones obtained in the present paper.

For hares (*Lepus Europaeus Pallas*) significant differences were observed, at the level of females and males, in just two studies conducted in Italy (Paci G. et al., 2007, Paci G. et al. 2006) witch have reviewed the implication of stress, habitat and density on metabolic profile.

In present study was also observed insignificant differences by gender for rabbits Belgian Giant breed and for hares *Lepus Europaeus Pallas* which corresponds with the results observed in other studies.

CONCLUSIONS

Changes occurring on the balance of animal body due to stress repeatedly presents negative consequences for their health, with significant changes in the water, energy and mineral balance. The result of this study provide an alternative set of biochemical reference values of serum that can be used in the clinical evaluation of the rabbits (Belgian

Giant breed) and hare (*Lepus Europaeus Pallas*), by gender. For the accuracy of interpretation of results, we have to take into account the factors that influence blood biochemical parameters of rabbits and hares (feed ration parameters of microclimate, breed (in particular for rabbits), age, sex, health status and metabolic activity). However was not observed deviations from normal of the biochemical components analyzed, characterizing thus the studied animals (rabbits and hares) as healthy.

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