

## METABOLIC REACTIONS AND ANIMAL BODY DISEASES IN VARIOUS FORMS OF STRESS - GENERAL ADAPTATION SYNDROME

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### ABSTRACT

*Animal bodies (mammalian and human body) show a great capacity for adaptation, both to the fluctuations of environmental factors and also regarding the nutrition, increasingly modified.*

*General Adaptation Syndrome (GAS) of organisms, began to be studied in animals and also in humans. In human bodies, GAS is studied because a number of disease with great significance psychologically, physiological but especially medical, appeared. In both categories of bodies, GAS is investigated by the presence of markers that highlight heart or cardiovascular disease, kidney disorders, nutritional and metabolic disorders - diabetes mellitus, also others more.*

*Specific markers for the assessment of GAS are endogenous particles (the best example being the body's own enzymes) but also exogenous (drugs, hormones, chemicals). The objective of this study is to analyze the activity of some enzymes, from human and animals blood samples, such as creatinphosphokinase CPK, lactatdehidrogenase LDH, alkaline phosphatase ALP and for glycosylated hemoglobin (human samples only).*

### INTRODUCTION

Stress is a general term which expresses a state of tension of the organisms, the term stress is being studied through a multitude of situations. The most important approach to stress is the medical one, with all that involves maintaining human health (Sources: Meica S., **Turcu S.2017**). Approach to this study is aimed at obtaining the data leading to better diagnosis of stressful situations based on biological markers.

The body's ability to defend itself against disturbing factors, can be quantified by assessing the activity of some endogenous serum components, the present research looks at the fluctuations of CPK, LDH, ALP and only in humans - HbA1c.

### MATERIAL AND METHOD

The working method is used both for human and veterinary samples (Sources: Websites 2):

**Creatinfosfokinaza (CPK)** catalyzes the reaction between creatine phosphate (CP) and adenosine -5-diphosphat (ADP) with formation of creatine and adenosine 5-triphosphate (ATP).

**Lactate dehidrogenase (LDH)** catalyzes the reduction of pyruvate to lactate (P-L) in the presence of reduced nicotinamide adenine dinucleotide (NADH) at pH 7.5.

**Alkaline phosphatase (ALP)** catalyze the hydrolysis of 4- nitrophenylphosphate (4-NPP) with the formation of free 4- nitrophenol and inorganic phosphate, acting the alkaline buffer as a phosphate-group acceptor. The reaction is monitored kinetically at

405 nm by the rate of formation of 4-nitrophenol, proportional to the activity of ALP present in the sample.

**Hemoglobin glycosylated (HbA1c)** occurs as a result of tying a glucose molecule at the N-terminal of hemoglobin, is a non-enzymatic process, reflects an average of hemoglobin exposures to glucose over a long period of time.

## RESEARCH RESULTS

Samples studied have been processed statistically, from animal and human, the results being expressed as follows:

1. Blood samples analyzed from **animals** covered the observation for CPK, LDH and ALP, HbA1c is not analyzed, it is replaced with fructosamine, because it requires a lot of biological substrate and is rarely done. For the present study, The biological samples studied it was taken from from canines and pigs.

Samples analyzed for **CPK** has taken from 10 dogs, patients aged 4-11 years, 5 males and 5 females, between September 2016 until March 2017. Of all the evidence, the values of 90% of them were above the upper limit of the reference range and 10% at the lower limit. Of the 9 individuals upper limit of the reference range, 44% had hormonal disorders, 33% of metabolism and 22% with dermatitis, nutritional, urological and oncological imbalances. In the case of pigs, 25 samples were collected and analyzed from subjects aged 2-150 days, 15 males and 10 females, between March and April 2017. 64% of individuals had CPK values within normal range, and 36% with values above the upper limit admitted where they were highlighted in 100% of cases had metabolic and nutritional disorders and 22% of these hormone impairment.

In the case of **LDH** for canines, 11 samples were analyzed from individuals, aged 1-13 years, 5 females and 6 males, in September 2016 - March 2017. 27% of subjects had values in the normal range and 73% of them, with values above the reference limit, 75% of individuals with hormonal impairment, 50% of metabolism and 25% of them with dermatological, nutritional and oncological imbalances.

For pigs, was the same number of individuals as well as analyzed for CPK, 4 of them showed normal LDH values and 21 have exceeded reference values which were 100% owned by hormonal, metabolic and nutritional impairment.

For **ALP**, a number of canines of were tested was 10 individuals, 1-13 years, 6 males and 4 females, between August 2016 and February 2017. Results of a single individual's analysis were within the normal reference range but 9 of them, were values above the upper limit admitted, being 6 cases with hormonal impairment, 3 dermatological and 2 metabolic and oncological.

At pigs 25 samples were processed, between March and April 2017, 15 males and 10 females, aged 2-150 days. At 10 of them ALP values were in the normal reference range and at 15 individuals have noticed 15 cases with metabolic and nutritional impairment, 7 individuals with hormonal impairment. In the Table no. 1 are presented the correlation made on animals:

**Table no. 1 Correlation of GAS indicators in animals**

No.	Type marker	Species /no. Individuals/s ex	Age /years	Analysis data	% samples upper limit/ low limit	Systemic damage
1.	CPK	canine /10 5♂/5♀	4-11 years	Sept.2016- Mar.2017	90% upper limit 10 % low limit	44% hormonal; 33% metabolic; 22% dermatological, nutrition, urological, oncological.
		pigs /25 15♂/10♀	2-150 days	Mar.- Apr.2017	36% upper limit 64% low limit	100% nutrition, metabolic; 22% hormonal.
2.	LDH	canine /11 6♂/5♀	1-13 years	Sept.2016- Mar.2017	73% upper limit 27% low limit	75% hormonal; 50% metabolic; 25% dermatological, nutrition and oncological.
		pigs /25 15♂/10♀	2-150 days	Mar.- Apr.2017	84% upper limit 16% low limit	100% hormonal, metabolic and nutrition.
3.	ALP	canine /10 6♂/4♀	1-13 years	Aug.2016- Feb.2017	90% upper limit 10% low limit	67% hormonal; 33% dermatological; 22% metabolic and oncological.
		pigs /25 15♂/10♀	2-150 days	Mar.- Apr.2017	60% upper limit 40% low limit	100% nutrition and metabolic; 47% hormonal.

2. In **human samples** have been analyzed CPK, LDH ALP and HbA1c, in a much larger number compared to animals, as shown in table no. 2.

**Table no. 2 Correlation of SGA indicators in human samples**

No.	Type marker	No. total samples	Age / years	Range samples	Sex patients	% samples			Systemic damage
						% inferior limit	% normal limit	% upper limit	
1.	CPK	50	16-88	Ian.2015- Iun.2016	8♂/42♀	10%	46%	44%	82% circulatory, 73% bone damage, 64% nutrition and metabolic, 50% liver and neurological, 45% cardiac disorder.
2.	LDH	50	18-85	Dec.2015 - Iun.2016	12♂/38♀	6%	32%	62%	64,5% cardiac disorder, 61% metabolic, 55% circulatory and liver, 45% bone disorder, 42% autoimmune diseases.
3.	ALP	50	21-80	Ian.2015- Iun.2016	12♂/38♀	14%	46%	40%	75% circulatory and kidney, 70% liver damage, 65% cardiac disorder, 60% metabolic, 45% digestiv and nutrition
4.	HbA1c	30	16-80	Ian.2015- Iun.2016	10♂/20♀	3%	14%	83%	84% liver damage, 80% metabolic, 76% circulatory, 64% kidney damage, 52% cardiac, bone disorders.

**CPK** has been reviewed in a number of 50 individuals, 8 males and 42 women aged between 16 and 88, from January 2015 until June 2016. Of them 46% had values within the reference range, 44% had values above the admitted limit, 10% having values below the permissible limit. For subjects with values above the upper limit of the reference range, representative for this indicator is the percentage of 82% with circulatory impairment, 73% have bone disorders, 64% nutritional and metabolic imbalances, 50% of them hepatic and neurological and 45% cardiological.

**LDH** was analyzed in a total of 50 individuals, 12 men and 38 women, aged 16 to 85, between January 2015 and June 2016. Of them, 32% had values in the reference range, 62% had values above the admitted limit, 6% having values below the permitted limit. For subjects with values above the upper limit of the reference range, representative of this indicator is the percentage of 64.5% patients with cardiac disease, 61% of

metabolism, 55% of patients with hepatic and circulatory impairment, 45% of them with bone and bone disease and 42% with autoimmune diseases.

**ALP** was analyzed in a total of 50 individuals, 12 men and 38 women, aged 21 to 80, between January 2015 and June 2016. Of these, 46% had values within the reference range, 40% had values above the admitted limit, 14% having values below the permitted limit. For subjects with values above the upper limit of the reference range. Representative of this indicator is the percentage of 75% with diagnoses of circulatory and renal impairment, 70% of them had liver disease, 65% cardiac disease, 60% of metabolism, 45% digestive and nutritional.

For **HbA1c**, was analyzed a number of 30 individuals, 10 men and 20 women, aged between 16 and 80, from January 2015 until June 2016. Of these, 14% had values within the reference range, 83% had values above the allowed limit, 3% having values below the permitted limit. For subjects with values above the upper limit of the reference range, representative for this indicator is 84% with liver impairment, 80% metabolic problems, 76% of them have circulatory disorders and diabetes especially, 64% have renal impairment, 52% cardiac disease and bone system.

### CONCLUSIONS

The results of this study lead to that endogenous biological indicators CPK, LDH, ALP and HbA1c can be considered markers for body system organisms (animals and humans), which proves the percentage highlighted in the above tables. After the statistical situation, the indicators analyzed can be considered as markers for certification diagnostics of the most serious human health problems 21st Century - cardiological, circulatory, kidney, liver, nutrition and metabolism disorders.

Statistical data processing shows that they were analyzed in the study a much higher number of females / women, however, this does not influence the percentage of markers in this study. Data collection was done in all four seasons with the aim of obtaining a more concrete mean of a clinical conditions of patients (human and veterinary) hospitalized.

HbA1c is tested only for human assays, for which much higher costs are allocated, as it is not used as an indicator for animal health because it requires large amounts of biological resources, this being one of the new directions of research.

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