

Determination of some normal serum parameters in juvenile Sevruga sturgeons *Acipenser stellatus* (Pallas, 1771)

Tanți Patriche^{1†}, N. Patriche², Elena Bocioc³

¹*University „Dunărea de Jos” of Galați, Faculty of Medicine and Pharmacy, Galați, Romania*

²*Institute for Research and Development in Aquatic Ecology, Fishing and Aquaculture, Galati, Romania*

³*University „Dunărea de Jos” of Galați,, Department of Aquaculture, Environment Science and Cadastre, Galați, Romania*

SUMMARY

To be aware of the health condition of the biological material in a fish farm allows us to establish the preventive measures required to prevent spreading of a disease and the treatment to be applied in case that a mass disease occurs. That is why to know the normal value of the serum glycemia, the total protein and the protein fractions in serum enables us to differentiate the normal physiological condition of the fish material under research from the eventual pathological modifications having occurred due to the defense reaction of the organism. The level of the serum glycemia representing a high value marker indicator of the stress condition, while the level of total protein in serum is, first of all, a synthetic indicator of the nutritional condition of the organism. The most part of diseases have but a little influence on the concentration of the total protein in the blood, but some influence on certain protein fractions, and they alter the ratio between albumins and globulins. A decrease below 0.3 in value of the ratio albumins/globulins in serum is significant for the health condition of fish.

Keywords: Sevruga, glycemia, total protein, albumin, disease.

INTRODUCTION

In aquaculture, as in any other sector where work is done on alive organisms, to get a high production is conditioned by awareness and keeping of an unaltered health condition of the biological material.

That is why to know the normal value of the serical glycemia, the total protein and the protein fractions in serum enables us to differentiate the normal physiological condition of the fish material under research from the eventual

[†] Corresponding author e-mail: tanti.patriche@yahoo.com

pathological modifications having occurred due to the defence reaction of the organism.

Glucose is the most important component of the plasmatic glucids and represents a permanent and immediate source of energy necessary for the operation of heart and of the muscles. The concentration of glucose in blood, expressed in mg/dl, is defined by the word glycemia. To keep the glycemia within certain normal limits is one of the mechanisms with the finest homeostatic adjustment, to which the hepatopancreas participates, as well as some extrahepatic tissues and a series of endocrine glands. To dose the serical glycemie at fish represents the fastest and cost efficient method of evaluating the stress condition.

As per the illustrated elements, the main elements of blood are the total proteins in plasma; that is why to know their value represents an essential factor in determining the health condition of fish. From the chemical point of view, the plasmatic proteins represent a heterogeneous mixture of about 100 components with physical-chemical proprieties and different functions. They are synthesized in liver, spleen, plasmatic cells, lymphatic ganglions and they carry out several functions in the organism:

1. to maintain the normal volume and the steady osmotic pressure of blood;
2. to carry numerous substances;
3. to participate in the specific and nonspecific processes of defense of the organism;
4. to maintain the acid-basic equilibrium of blood due to their amphoteric nature;
5. to influence viscosity and microcirculation;
6. to represent a considerable reserve of proteins of the organism.

With some fish species, the proteins in plasma represent 1.6-3.5% from the total volume of plasma. This value is influenced by several factors that alter both the global level of proteins in plasma and the ratio between the protein fractions in serum, such as the ratio albumins/globulins. The causes leading to a decrease in the level of albumins in serum are, mainly, the same as those leading to a decrease in the total protein in serum. While the decrease in the total protein in serum indicates, especially, an improper input of protein from food, the decrease in the value of the ratio albumins/globulins (A/G) indicate a possible disease.

MATERIAL AND METHODS

In order to determine the value of the glycaemia (GLU), the total protein (TP) and protein fractions in fish serum, blood samples have been collected from *Acipenser stellatus* (the recirculating system of intensive growth of sturgeons within Institute of Research and Development for Aquatic Ecology, Fisheries and Aquaculture - Galati, Romania) of different age and weight.

Blood glucose and total proteins were made by standard methods from human. The technique used is dry biochemical and the analyzer used is VITROS 750.

The most applied method to separate the protein fractions from serum is the electrophoresis standard methods from human. The EXPRIME 72 analyzer is used for electrophoresis method. This method makes use agarosse gel support and of a buffer solution with pH = 8.6. At this pH all protein components are negatively charged and migrate from cathode (-) towards anode (+). The electrophoregram, after coloration, presents the protein fractions in the form of coloured strips (Figure 1).

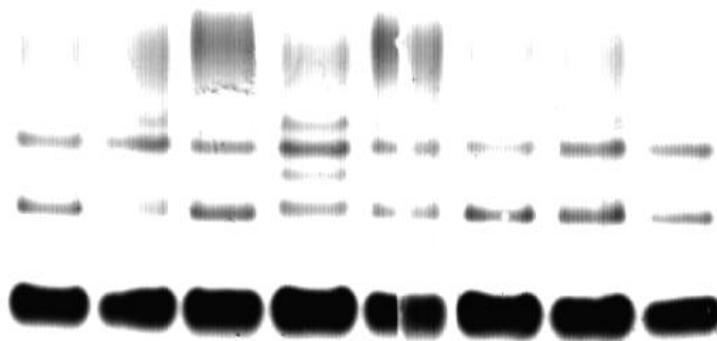


Figure 1

RESULTS AND DISCUSSION

Fish blood normally contains 40-90 mg/dl glucose (Reickenbach Klinke, 1984) and 3.5 -5.5 mg/dl total protein (A.K. Siwieki and D.P. Anderson, 1993). A decrease below 0.3 in value of the ratio albumins/globulins in serum is significant for the health condition of fish.

Determinations made in the period 2004-2007, on blood taken from sevruga sturgeon and indicated different values of the serum glycaemia, the total protein (table no.1) and the protein fractions in serum level (table no.2).

The following table gives, for each age of fish under study, the values registered for the biochemical indicators.

Table 1

| Sevruga | GL, mg/dl | Pt, g/dl |
|----------|-----------|----------|
| 3 months | 38±5 | 2.2±0.4 |
| 1 year | 61±10 | 3±0.5 |
| 2 years | 80±20 | 3.3±0.3 |

The value of the serum glycaemia, the total protein and the protein fractions in serum presents quite ample variation, depending on a series of factors, such

as: age, the food diet, season, degree of sexual maturity, water temperature the massive degree of infection, the etiological agent of disease, and others.

Table 2

| Electrophoresis (%) | Average values | | |
|---------------------|----------------|---------|---------|
| | 1 year | 2 years | 3 years |
| Albumins | 29.7 | 27.8 | 26.5 |
| Globulins | | | |
| α_1 | 1.1 | 2 | 1.5 |
| α_2 | 8.3 | 10.9 | 9.8 |
| β | 28.2 | 27.4 | 21.6 |
| γ | 33.1 | 31.9 | 40.6 |
| Ratio A/G | 0.42 | 0.39 | 0.36 |

In general, the intensive growth of animals, including fish, involves great concentrations of individuals in a limited space. Increase in density of fish parked in closed spaces diminishes in corresponding proportion the vital space of each individual. The consequence is occurrence of some neurohormonal modifications, stress phenomena, with direct implications on concentration of glycaemia in the blood.

CONCLUSIONS

The level of glucose and total protein in blood is easily changed under the influence of some external or internal factors. This explains the importance as biochemical indicator of reference in evaluating the degree of normality of the general physiological condition.

Glycaemia has an important role in evaluating the stress condition.

Sevruga sturgeon and blood contains, normally, 30-75 mg/dl.

The increase in glycaemia value above the normal limit (3-5 times) was met in all stress conditions, acute or chronic, as well as in the incipient stage of an infectious disease. A high decrease in serum glycaemia value was noticed in certain infectious diseases and in the conditions of chronic inanition.

Total protein is the most important indicator of the nutritional condition of the organism and of fish health condition.

Sevruga sturgeon and blood contains, normally, 2-3,5 mg/dl.

The low level of protein indicates a non corresponding contribution of protein to food, and its lack in the period of intense activity of fish can accelerate the protein catabolism, until the total exhaustion of organism is reached.

After the study made by us, it was obvious that the ample perturbation of the homeostatic equilibrium of the farmed sevruga organism by installation of the disease condition is directly bound to the modification of the value of protein level in blood. A correlation was found between the value of protein

level and the extent of infestation. The more infested the fish, the lower the value of the protein level.

Five protein fractions were found to sevruga sturgeon. The unhealthy sturgeons increased values of β and γ -globulins to the detriment of albumins. The decrease in the ratio albumins/globulins (A/G) below 0.3 indicates a disease with significant physiological implications, especially concerning the immune capacity.

The data registered during the study indicates a direct correlation between the level of the total protein in serum and the temperature of fish growing water, the hypoprotein level being more accentuated while the hypothermia is increased.

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