THE IMPORTANCE OF GLUCOSE DETERMINATION IN THE BLOOD OF THE CYPRINIDS

IMPORTANȚA DETERMINĂRIII GLUCOZEI DIN SÂNGELE CIPRINIDELOR

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The range of paraclinical investigations applied in ichthyopathology aims at assessing those parameters biochemical that can define the pathological modifications and the normal physiological condition of the fish materia. Modification in value of these indicators points out some metabolic perturbations in fish body. To be aware of the health condition of the biological material in a fish farm allows us to stablish 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 value of the serical glycemia enables us to differentiate the normal physiological condition of the fish material under research from the eventual pathological modifications having occurred due to the defence reaction of the organism, the first representing a high value marker indicator of the stress condition (Kebus and colab., 1992; De Dominis and colab., 1993; Barry and colab., 1993; Bau and colab., 1994; Rehulka, 1996).

Keywords: serical glycemia, determination, carp, stress.

Introduction

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 level of glucose in blood is easily changed under the influence of some external or internal factors. This explains its importance as biochemical indicator of reference in evaluating the degree of normality of the general physiological condition. 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 glycemia at fish represents the fastest and cost efficient method of evaluating the stress condition (Popescu and colab., 1990).
To reveal the stress condition by means of this biochemical indicator of high sensitivity at an apparently healthy fish population, is important because the broodstock lots or the fingerling lots used as populating material should be protected even from the temporary stress. This protection shouldn’t be started when fish present clear signs of comfort perturbation or when they start to die, but much earlier. It is for this reason why to determine glycemia at fish can be of great use.

To determine the value of glycemia at the sick fish is justified by the „capacity” of this biochemical indicator to mark the functional perturbations of the organism.

Even since the incipient stage of the action of the pathogenic agents, when fish do not present clear signs of illness, the organism responds properly, by reconsidering its reserves of oxygen and energy, to face the pathogenic agent. Thus, the mechanisms of releasing the glucose from tissues start acting and pass it into the peripheral blood, where it can be determined by quantitative methods of dosing.

Materials and Methods

Our research regarding determination of the glycemia in the blood have been made on the specie carp (Cyprinus carpio) specie.

In order to achieve the pursued goal, the studies have been made on blood samples collected from fish material of different age, weight and from two fish farms:

- Pleașa Fish Farm – Prahova County;
- Brateș Fish Farm I.C.D.E.A.P.A. Galati.

Fish blood normally contains 40-90 mg glucose at 100 ml of blood (Reickenbach Klinke, 1984), in comparasion to 70-110 mg at 100 ml of blood, found in the blood of the healthy human being. For this reason, the same methods to determine glucose in the blood of human beings can be applied.

The level of glycemia in the blood of some fresh water species varies between 25-200 mg/dl, according to some authors indicated in the specialized literature.

According to other authors, the farmed carp has normal values of serical glycemia comprised between 25-54 mg/dl (Ghittino, 1983).

The glycemia at fish, presents quite ample variations, also depending on a series of factors, such as: the food diet, species, season, degree of sexual maturity, water temperature and others.

Results and Discussion

The determinations made during the experiments have indicated the following average values of the serical glycemia at the fish species under study, tablo no.1.
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 glycemia in the blood.

In case of carp species (Cyprinus carpio), the individuals examined during experiments, have originated from two fish farms having made use, for growth and winter period, of different densities per hectar. Thus:

- **Batch I** - Brateș Fish Farm I.C.D.E.A.P.A. Galati, density per hectar:
  - summer – 2700 Kg/ha;
  - winter – 7200 Kg/ha.

- **Batch II** - Pleașa Fish Farm, density per hectar:
  - summer – 4200 Kg/ha;
  - winter – 9000 Kg/ha.

### Image

**Batch I - Brateș Fish Farm I.C.D.E.A.P.A. Galati**

![Pie chart showing glycemia values](image)

From the individuals examined in batch I (with a low density per hectar) in September, before entering the winter period, only 9% have presented values of serical glycemia above the normal values (graphic no.1), while in case of the individuals examined in the same month, in batch II (with a high density per hectar) 53% have presented values of serical glycemia above the normal values (graphic no.2).
This is explained by installation of the over-density cranical stress to the fish population examined at Pleaşă Fish Farm.

**Graphic no. 2**

**Batch II - Pleaşă Fish Farm - Prahova County**

- 29% below the normal value
- 18% normal value
- 53% above the normal value

The food regime and the feeding procedure of fish represent important factors of variation for the values of the serical glycemia. In case of farmed species, the values of glycemia are tightly correlated with the glucidic composition of catch, graphic no.3.

**Graphic no.3**

Values of the serical glycemia in respect with food regime

During experiments, at the fish material taken from the two locations under study, different values of serical glycemia have been recorded due to the administrated palleted fodder.

- **Batch I** - Brateş Fish Farm I.C.D.E.A.P.A. Galati, low protein food content (gross protein 20-24%) and glucids;
- **Batch II** - Pleaşă Fish Farm Prahova County, high protein food content (gross protein 35-40%) and glucids.
It is obvious that the fish material in batch I, that was fed with a fodder with lower protein and glucid content, recorded in autumn less values of the serical glycemia, in comparison to the fish material examined in the same period in batch II, that was fed with a high protein and glucid content food.

Conclusions

- Glycemia has an important role in evaluating the stress condition.
- Fish blood contains, normally, 40-90 mg/dl.
- The level of glucose in blood is easily changed under the influence of some external or internal factors. This explains its importance as biochemical indicator of reference in evaluating the degree of normality of the general physiological condition.
- The concentration of glucose in blood, expressed in mg/dl, is defined by the word glycemia.
- The analyses made by us on fish individuals presenting clear signs of infectious disease or with a high degree of parazites, revealed the special physiological importance of this biochemical indicator.
- The increase in glycemia value above the normal limit (3-5 times) was met in all stress conditions, acute or cronical, as well as in the incipient stage of an infectious disease.
- A high decrease in serical glycemia value was noticed in certain infectious diseases and in the conditions of cronical inanition.

References

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