

# Variation of Blood Plasma Gamma-Glutamyltransferase and Total Protein Concentrations in Holstein Calves

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## Abstract

The aim of our study was to evaluate the changes of blood plasma Gamma-glutamyltransferase (GGT) and total protein concentrations during the growth of Holstein calves. Blood samples were collected from 20 calves divided in two groups (group 1 from 1 to 3 month of age and group 2 from over 3 months to 5 months of age). Mean value of GGT in group 1 was 32.2 IU/L and 27.2 IU/L in group 2. Mean value of total protein was 7.14 g/dl in group 1 and 6.92 g/dl in group 2. The slight changes in concentrations of GGT and total protein may be related to maturity of organs initiation of specific enzymatic activities or simply physiological adaptation of calves to the new environment.

**Keywords:** GGT, Holstein calves, total serum protein

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## 1. Introduction

Biochemical analyses blood serum are very useful to diagnose disease problems in calves. Veterinarians, producers and nutrition consultants alike seen to be interested in extracting pertinent information relative to calves nutrition and health status from blood tests.

The majority of biochemical parameters in young animals differ with the age. Some parameters like total serum protein, globulins and gamma-glutamyltransferase (GGT) are influenced by the first colostrums intake.

GGT is a carboxypeptidase which cleaves C. terminal glutamyl groups and transfers them to peptides and other suitable acceptors. GGT occurs as a membrane associated aggregate with a Molecular Weight (MW) of 90-350 000.

The major concentrations of the enzyme are on the brush border of renal and bile cell epithelium and the pancreas.

Serum GGT is almost all derivate from the liver and is often associated with other enzymes from the same area such as 5-nucleotidase. GGT is often used to confirm biliary tract disease in association with alkaline phosphatase (ALP). Urinary GGT can be used as a marker of renal disease.

Cow and ewe colostrums contain large amounts of GGT which with the colostrum antibody is readily transferred to the neonate's serum.

Clinical interpretation: Raised values may be seen in used:

- Newborn calves X60 fold increase (GGT assay has been used to predict serum gamma-globules in calves and lambs <8 days postpartum);
- Bile duct epithelial proliferation;
- Cholestatic disorders;
- Chronic and toxic hepatopathies;
- Steroid therapy;
- Cirrhosis;
- Fascioliasis;
- Metastatic carcinoma and in filtrations.

The biochemical parameters in calves have been investigated by many authors [2, 3, 4, 1]. Because there are differences between various

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geographically distinct populations of animals, it is extremely useful to have reference values which are based upon own measurements.

The aim of our study was to evaluate the changes of some biochemical parameters during the growth of offspring of primiparous cows imported from EU countries in a commercial dairy farm. In this paper we will present variations of blood plasma GGT.

## 2. Materials and methods

A total of 20 Holstein calves of different sexes and between 1 to 5 months of age were used. Calves were divided in two groups: group 1 from 1 to 3 months of age (n=10) and group 2 from over 3 months to 5 months of age (n=10).

Blood samples were drawn by venipuncture from the jugular vein into vacuum tubes. The clinical chemistry determinations were conducted by the laboratory of the Institute for Diagnosis and Animal Health Bucharest Romania. All calves were from the same herd consisting of the 750 primiparous cows imported from EU countries (as pregnant heifers).

The calves were housed in individual boxes for the first 2 months than in groups of 5 calves.

They were weaned at 70 days of age. The basic statistical parameters were calculated.

## 3. Results and discussion

Mean values of serum GGT and protein concentrations are presented below (Table 1).

**Table 1.** Mean values of serum Gamma-glutamyltransferase (GGT) and protein concentrations

Group no.	GGT IU/L Mean ± S.D.	GGT Reference interval <sup>1</sup> IU/L	Total serum Protein g/L Mean ± S.D.	Total serum protein Reference interval <sup>1</sup> g/L
Group 1	32.2 ± 14.59	15-39	7.14 ± 0.24	6.8-8.6
Group 2	27.2 ± 5.99		6.92 ± 0.14	

<sup>1</sup>[1]

Mean value of serum GGT was in group 1, 32.2 IU/L ± 14.59 and in group 2, 27.2 IU/L ± 5.99. All values were in the range of reference values (Table 1) but values in group 2 decreased with 15.6%.

In calves, the GGT activity can be more than 200 fold to upper limit of the adult reference interval during the first 3 days after birth. Typically, a three to four fold decrease occurs in this activity by the end of the first week and activity gradually continues decreasing to within the adult reference interval by 6 to 13 weeks of age [4].

Sucking neonatal animals tend to have moderately higher GGT than do adult animals [1].

Mean value of serum total protein was in group 1, 7.17 g/L ± 0.24 and in group 2, 6.92 g/L ± 0.14. No significant changes in total protein concentration were found apart its slight decrease in group 2.

The total protein content in blood plasma is one of the indicators of nitrogen metabolism in the organism and depends on the protein content in fodder.

## 4. Conclusions

The slight changes in concentrations of the various blood constituents may be related to maturity of organs, initiation of specific enzymatic activities or simple physiological adaptation of calves to the new environment.

The levels of total protein content in blood plasma remained at the bottom limits of reference interval; indicate a need to correct protein content of their diet.

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