

**N.Barnabishvili, Z.Kheladze, Zv.Kheladze, E.Ivanidze (Tbilisi, Georgia; Tashkent, Uzbekistan)**

### **Diagnostic value of “Catepsine – S” and “Alveomucyne” in critical patients**

#### **Abstract:**

The concentration of Catepsine-S and Alveomucyne in critical patients was studied. The former was found in increased concentration in all types of critical condition, especially in diseased patients. The increase of Alveomucyne concentration was observed in patients on artificial ventilation. It was more acute in patients with different complications: bronchitis, pneumonia, etc.

**Keywords: Concentration of Catepsine-S and Alveomucyne, critical patients, diseased patients**

#### **Introduction:**

Cathepsins are, mainly intercellular proteases. The majority of cathepsins show activity within the lysosomes – they break cohesion molecules of a cell. [5] According to active zone structure, there are cysteine, serine and aspartate proteases. Cysteine cathepsin group is respectively numerous which includes B,C,H,L,K,O,S,X,W cathepeins. Cathepsins A, G belong to the serine group, and D and E cathepsins belong to aspartate cathepsins group. The optimal pH for cathepsins activity is 3.8. Their activity is increased in cancerogenic cells. B group cathepsins are tripsin-like, D group cathepsins act like pepsin and make other cathepsins active. G group cathepsins are, especially active in polymorphic nuclear leukocytes and act like chemotrypsin. Cathepsin S is known as CTTS – it is a protein which is encoded with CTTS gen. [5,6]

The studies have proven that cathepsin S represents a determinantal factor for patients' vitality. Its suppression in patients diseased with astrocytoma prolonged the life of patients by at least 5 months. This was caused because of the fact that cysteine proteases had not capability to react together with other proteinases and provoke degradation of extracellular matrix, which impeded the dispersion of cancer development. According to the latest data the existence of cathepsin S above the certain level causes natural death of humans in the nearest 5 years. [7,8] The scientists of Uppsala University (Sweden) Medical School performed interesting research. During 20 years they monitored patients up to 70 years age. They were interested in detection of reasons of approaching death signals. Up to 2000 Swedish persons took part in this long-term research. In these twenty years 25% of the patients died because of different reasons. The researchers have collected the complete statistics of examination/research. They took in consideration diseases, bad habits, blood pressure and age at the moment of death, after which the interesting fact was revealed. The connection between approaching death and cathepsin S was detected, according to scientists the increased dose of cathepsin S in aged persons increases death risk twice in the nearest 5 years and on the contrary, those patients having low level of cathepsin have lived these 20 years normal life. It should be mentioned that 2 most spread reasons of death in relation with cathepsin molecule oncological and cardiovascular diseases were detected. It should be mentioned that 2 most spread reasons of death in relation with cathepsin molecule oncological and cardiovascular diseases were detected.

Cathepsin S has an important role in biochemical processes in the organism. The mechanism of this action – why these molecules are ecreted in lethal diseases- currently is unknown. It may be said that the increased amount/volume of cathepsin S is a dangerous signal. [5,7,8]. Alveomucin or alveomucin antigen 3EG5 is produced in bronchi. In second type alveocytes and norma it is transformed in bronchoalveolar secretion. The increase of its concentration in blood is detected during interstitial lung diseases, at the same time, concentration level correlates with the the gravity of the disease and its manifestation extent. Determination of alveomucin is important in order to estimate the inflammation process activity and gravity level. [1,2,3,4] The scope of the research was to study content of cathepsin s and alveomucin in the patients of critical medicine institute and their relation with disease output.

### Materials and methods:

The blood serum of 88 persons was examined on the existence of cathepsin S and alveomucin. 78 of them were the patients of Critical Medicine Institute, 10 belonged to control group, representing persons from pre-induction age to 25 years old that were practically healthy and made preventive examination. The age of patients of Critical Medicine Institute varied from 30 to 90 years. In the diagnoses there were insult, respiratory failure, multiple organ failure, 20 of them were on artificial respiration, 50 of them on spontaneous respiration. 8 of them have undergone different surgical intervention/operations, but they didn't appertain to the category of critical patients. The examination was performed according to immunoenzyme method based on given instructions. Immunoenzyme test systems of EIAAB for cathepsin and XEMA-medica for alveuminic were used in the research. Statistical processing of the data was performed according to Stuedend technique in automatic mode.

### Results and discussion:

The result of the research is given in the table: Table N1

| Indicator                          | Examined groups   |                              |                              |                 |
|------------------------------------|-------------------|------------------------------|------------------------------|-----------------|
|                                    | Healthy ones n=10 | Diseases persons             |                              |                 |
|                                    |                   | Spontaneous respiration n=50 | Artificial respiration n =20 | Operated on n=8 |
| Concentration of cathepsin S pg/ml | 20-90             | 651-3900                     | 1301-5000                    | 40-90           |
|                                    | 51±2.55           | 1475.02±88.5                 | 2262.7±90.48                 | 54.36±2.17      |
| T cr                               | 1.99              | 6.4                          | 5.6                          | 0.5             |
|                                    | p≤0.05            | p≤0.05                       | p≤0.05                       | p≥0.01          |
| Concentration of alveomucin U/ml   | 18-52             | 23-130                       | 30-400                       | 19-72           |
|                                    | 30,64±1.57        | 63.05±2.89                   | 103.05±4.12                  | 39.82±1.68      |
| T cr                               | 2.23              | 4.8                          | 2.9                          | 3.17            |
|                                    | p≤0.05            | p≤0.05                       | p≤0.05                       | p≤0.05          |

The results of cathepsin and alveomucin examination in patients and healthy donors.

As it is shown in the table the concentration of cathepsin in healthy donors and in patients operated on does not exceed 90pg/ml (consequently, 20-90 and 40-90). This indicator was by 2-3 logarithms more than the data of control group. In patients on respiration the average concentration was 1475 pg/ml, and in patients on artificial ventilation of lungs it varied from 1300 to 5000 pg/ml (average quantity 2262 pg/ml), which for certain exceeds the data of healthy donors. The concentration of cathepsin in healthy population of Georgia is not studied and the level of its standard indicator in general, is still the point of discussion/dispute. In any case in this given research the data of healthy donors was taken as standard indicators. The concentrations of cathepsin were analysed in alive and dead patients.

The results are given in the table.

**Table N2.** The concentration of cathepsin in alive and dead patients.

| Group of Examined persons | Cathepsin concentration<br>pg/ml | Average indicator | Tcr | Data reliability |                |
|---------------------------|----------------------------------|-------------------|-----|------------------|----------------|
| Alive n=48                | 651-5000                         | 1475±98.5         | 6.3 | 2.25<br>p≤0.05   | 2.98<br>p≤0.01 |
| Dead n=22                 | 2500-5000                        | 2959.82±5<br>9.18 | 9.0 | 2.09<br>p≤0.05   | 2.85<br>p≤0.01 |

As it is shown from the table, the average concentration of cathepsin in dead persons according to quality is higher than in alive patients. The index of reliability indicator is, consequently, 9,0 and 6,3 that is included in the zone of reliable empirical importance. The results of alveomucin research are given in the table N1. Contrary to cathepsin, < 70 U/ml is approved as a norma value for alveomucin. Its average indicator in healthy donors and in patients operated on varied within the scopes of 30-39 U/ml, which is in accordance with the data given in the literature. In patients being on spontaneous respiration, it varied within the frames of 23-130 U/ml, at the average this indicator did not exceed 63 U/ml and only in 4 cases i.e. 8% of cases was more than the norma. As for patients being on lungs artificial ventilation, the concentration of alveomucin in their blood, fluctuated between 30-400 U/ml and at average it was 103 U/ml. In 11 cases i.e in 50% the concentration was significantly over norma. The analysis of alveomucin concentrations is given in the table N3.

As it is shown in the table, the concentration of alveomucin in alive persons is more than norma, but at the average it did not exceed 103 U/ml and in dead persons this indicator equaled to 375 U/ml. The index of reliability indicator is 2,95 and 4,78 which is included in the zone of reliable empirical importance.

**Table N3.** The concentration of alveomucin in alive and dead patients.

| Group of examined persons | Alveomucin concentration<br>U/ml | Average indicator | Tcr  | Data reliability |             |
|---------------------------|----------------------------------|-------------------|------|------------------|-------------|
| Alive n=48                | 23-400                           | 103.05±4,12       | 2.95 | 2.04 p≤0.05      | 2.67 p≤0.01 |
| Dead n=22                 | 30-400                           | 375-±22.7         | 4.78 | 2.04 p≤0.05      | 2.74 p≤0.01 |

On the chart there are cathepsin and alveomucin concentrations in different conditions/situations. Thus, first in Georgia, in the clinic of Critical Medicine Institute was studied cathepsin and alveomucin in patients of different categories and in healthy donors. The study of cathepsin level in population, is not enough in such dose of course and it cannot give us the possibility to define approximate norma of this molecule. Though the fact that cathepsin concentrations in healthy persons and in persons operated on are very close, and in critical patients is higher in several logarithms. Its study gives us the possibility to use it in from the viewpoint of the prognosis/forecasting of diseases. Alveomucin concentration was reliably different in diseased and healthy contingent, especially in patients being on artificial lung ventilation, so it is possible to use this marker in consideration of forecasting the gravity of disease. In our case we were not able to distinguish whether the gravity of disease determined the high alveomucin concentration in patients on artificial lung ventilation or it was caused by artificial ventilation itself. This issue will be discussed in further studies.

ნ.ბარნაბიშვილი, ზ.ხელაძე, ზვ.ხელაძე, ე.ივანიძე (თბილისი, საქართველო; ტაშკენტი, უზბეკეთი)

„კატეფსინ - S“ და „ალვეომუცინი“ - ს სადიაგნოზო მნიშვნელობა კრიტიკულ ავადმყოფებში

შესწავლილია კრიტიკულ მდგომარეობაში მყოფ პაციენტების სისხლში "კატეფსინ S"-ის და "ალვეომუცინის" შემცველობა. პირველი მათგანი მომატებული იყო ყველა სახის კრიტიკული მდგომარეობის დროს. ეს განსაკუთრებით შეიმჩნეოდა გარდაცვლილ ავადმყოფებში. ალვეომუცინის მომატება აღენიშნებოდა ხელოვნურ სუნთქვაზე მყოფ ავადმყოფებს. ეს განსაკუთრებით მკვეთრად იყო გამოხატული იმ პაციენტებში, რომელთაც აღენიშნებოდათ სასუნთქი სისტემის გართულებები ბრონქიტების, პნევმონიების და სხვათა სახით.