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*The activity of lysosomal enzymes of rabbit's thyroid gland  
during induced experimental diabetes*

The results of the investigations carried out in the Department and Chair of Human Anatomy show that the activity of rabbit's pancreatic lysosomal enzymes changes during induced experimental diabetes (2). Therefore, we have decided to investigate the activity of these enzymes of rabbit's thyroid gland.

MATERIAL AND METHODS

The material and methods of the investigations were like in the previous paper (1). An analysis of the enzymes activity was made with ANOVA. We agreed that if  $p < 0.05$ , it is statistically significant and if  $p < 0.01$ , it is highly statistically significant. For every effect, whose influence was significant on the average, differences between groups were tested using Duncan Test. Statistically indifferent averages between groups were indicated with the same capital letter.

RESULTS

Table 1 presents the activity of free lysosomal enzymes of rabbit's thyroid gland during induced experimental diabetes. From this table it appears that the activity of acid phosphatase decreased during the disease, reaching the highest value in the third week of diabetes. The activity of connecting acid phosphatase also decreased during the experiment, reaching the lowest value in the group of rabbits with 3-week diabetes.

The activity of free  $\beta$ -galactosidase, after the initial decrease, increased in the course of the disease reaching the highest level in the group of animals with 6-month diabetes. It was higher by 565.9% in comparison with the control group, which was highly statistically significant. The activity of connecting  $\beta$ -galactosidase, after the initial decrease also increased, reaching a value higher by 149.2% than in the control group after 6 months.

The activity of free N-acetylo-B-glucosaminidase (NAGL) after the initial decrease, increased to the 6th month of diabetes and reached a value by 152.7% higher in comparison with the control group, which was statistically significant. The activity of connecting NAGL decreased in the course of the experiment and it was the lowest in the group of rabbits with 3-week diabetes. It was lower by 71.1% in comparison with the control group, which was statistically significant. In the group with 6-week diabetes it slightly increased and was lower by 29.9% than in the control group.

Table 1. The activity of free lysosomal enzymes of rabbit's thyroid gland during induced experimental diabetes (mmol/mg protein/1 h of incubation)

Fraction of enzymes	Control group	3-week diabetes group	6-week diabetes group	3-month diabetes group	6-month diabetes group
Acid phosphatase	10.0085 ±2.01 A	4.33 ±0.82 B	4.66 ±0.96 B	5.01 ±1.02 B	5.89 ±1.16 B
β-galactosidase	2.120 ±0.41 A	2.5221 ±0.416 B	2.489 ±0.412 A	1.997 ±0.401 A	11.997 ±2.160 C
NAGL	14.990 ±2.992 A	12.845 ±2.421 A	15.101 ±3.011 A	20.099 ±5.018 B	22.887 ±5.524 B
Lipase	1.891 ±0.382 A	2.623 ±0.521 A	4.189 ±0.819 B	1.987 ±0.393 A	1.102 ±0.211 C
Sulphatase	0.236 ±0.045 A	0.4332 ±0.086 B	0.5015 ±1.02 B	0.0125 ±0.0021 C	0.225 ±0.041 A
Kathepsin B	5.168 ±1.36 A	5.162 ±1.34 A	15.236 ±3.49 B	26.189 ±5.92 C	7.892 ±1.53 D
Kathepsin D	117.82 ±33.82 A	92.89 ±18.21 A	58.82 ±12.65 B	63.11 ±12.92 C	60.11 ±12.02 C
Kathepsin L	29.92 ±5.18 A	24.38 ±4.992 A	19.01 ±3.95 B	19.25 ±3.99 B	13.87 ±2.681 C

The activity of free kathepsin B showed the increasing trend during diabetes, to reach the highest value with 3-month diabetes, higher by 506.7% in comparison with the control group, which was statistically significant. In the group with 6-month diabetes it demonstrated a decrease. The activity of connecting kathepsin B increased to the 3<sup>rd</sup> month of diabetes and was higher by 337.5% in this group than in the control group. In the 6<sup>th</sup> month of the disease it decreased by 19.4% in comparison with the control group, which was statistically significant.

The activity of free kathepsin D, in contrast to kathepsin B, decreased in the course of diabetes and it was lower by 49% in comparison with control group, which was statistically significant. The activity of this connected enzyme decreased too in the course of the disease, reaching in the 6<sup>th</sup> month of the investigation a value lower by 59.6% than in the control group, which was statistically significant.

The activity of free kathepsin L decreased too in the course of the investigation and it reached the minimum in the 6<sup>th</sup> month of diabetes. The minimum level was lower by 53.7% in comparison with the control group. The activity of connecting kathepsin L, after initial increase, decreased and it was lower in the 6-month diabetes group by 44.6% than in the control group, which was statistically significant.

The activity of free lipase increased initially and was the highest in the group of rabbits with 6-week diabetes (higher by 221.5% in comparison with the control group). Then it decreased and reached a value lower by 41.8% in the 6<sup>th</sup> month in comparison with the control group, which was statistically significant. The activity of connecting fraction of this enzyme considerably increased to reach the maximum level in the 6<sup>th</sup> week of the disease (higher by 448.6% in comparison with the control group), which was statistically significant.

The activity of free sulphatase, after the initial increase, decreased to the smallest value in the 3-month diabetes group. In this group the activity was lower by 94.7% than in the control group, which is statistically significant. The activity of connected sulphatase showed the same tendency and the maximum level in the 3rd month of the experiment was by 778.1% lower in comparison with the control group.

From our experiment it appears that the activity of free lysosomal enzymes: acid phosphatase, kathepsins D and L, sulphatase increased in the course of the diabetes similarly as in pancreas (2), however, others decreased. The activity of connecting acid phosphatase, NAGL and lipase increased similarly as in pancreas.

Table 2. The activity of connected lysosomal enzymes of rabbit's thyroid gland during induced experimental diabetes (mmol/mg protein/1 h of incubation)

Fraction of enzymes	Control group	3-week diabetes group	6-week diabetes group	3-month diabetes group	6-month diabetes group
Acid phosphatase	5.02 ±1.221 A	2.001 ±0.401 B	3.9901 ±0.89 C	2.997 ±6.01 D	3.102 ±0.621 D
β-galactosidase	1.628 ±0.241 A	1.097 ±0.218 A	0.629 ±0.125 B	2.348 ±0.51 C	2.429 ±0.55 C
NAGL	7.098 ±1.411 A	2.058 ±0.411 B	4.982 ±0.992 C	4.687 ±0.912 C	4.982 ±0.981 C
Lipase	3.996 ±0.718 A	3.623 ±0.712 A	17.925 ±3.921 B	13.999 ±2.881 C	14.225 ±2.924 C
Sulphatase	0.256 ±0.051 A	0.116 ±0.023 B	0.4338 ±0.087 C	1.992 ±0.411 D	0.762 ±0.145 E
Kathepsin B	4.952 ±0.982 A	6.825 ±1.225 B	16.725 ±3.325 C	16.714 ±3.321 C	3.891 ±0.722 D
Kathepsin D	98.77 ±19.82 A	71.25 ±14.05 B	59.82 ±12.16 C	61.01 ±12.25 C	39.92 ±8.01 D
Kathepsin L	22.82 ±4.721 A	24.01 ±4.835 A	21.89 ±4.181 A	22.09 ±4.192 A	14.92 ±2.98 B

## REFERENCES

1. W ó j t o w i c z Z. et al.: The activity of lysosomal enzymes of rabbit's gingiva mucosa during induced experimental diabetes. *Annales UMCS*, 60 (1), 369, 2005.
2. W ó j t o w i c z Z. et al. : The activity of pancreatic lysosomal enzymes of rabbit during induced experimental diabetes mellitus. *Annales UMCS*, 60 (2), 767, 2005.

## SUMMARY

The activity of free and connecting lysosomal enzymes of rabbit's thyroid gland was investigated during induced experimental diabetes. There was observed the decrease of the activity of free lysosomal enzymes: acid phosphatase, kathepsin D, kathepsin L, lipase and sulphatase and an increase of the activity of  $\beta$ -galactosidase, NAGL and kathepsin B. In the group of connecting fraction of enzymes, the decrease of the activity of acid phosphatase, NAGL, kathepsin B, D, L and lipase was observed.

Aktywność enzymów lizosomalnych gruczołu tarczowego u królika  
w przebiegu cukrzycy doświadczalnej

Przebadano aktywność wolnych i związanych enzymów lizosomalnych gruczołu tarczowego u królików w przebiegu cukrzycy doświadczalnej. Zaobserwowano spadek aktywności wolnych enzymów lizosomalnych: fosfatazy kwaśnej, katepsyny D, katepsyny L, lipazy i sulfatazy, natomiast wzrost  $\beta$ -galaktozydazy, NAGL i katepsyny B. Z enzymów związanych stwierdzono spadek aktywności fosfatazy kwaśnej, NAGL, katepsyny B, D, L i lipazy.