

Isolation Of Hydrolytic Enzymes By The Salivary Glands And Their Content In The Blood After Unilateral Nephrectomy

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Abstract – We studied the mechanisms of transformation of some salivary enzymes and established the real contribution of the salivary glands to the enzymatic homeostasis of the body in unilateral nephrectomy.

The results were obtained that with unilateral nephrectomy, the content of amylase and pepsinogen in the blood increases, but its lipolytic activity remains unchanged, the volume of basal secretion of the salivary glands, the content and release of amylase by the parotid salivary gland increases. Unilateral nephrectomy stimulates the increment of pepsinogen by the gastric glands, and, accordingly, enhances its recreation from the blood, by the salivary glands. After unilateral nephrectomy, lipolytic activity and its secretion in saliva remain unchanged.

Keywords – Homeostasis, Nephrectomy, Pepsinogen, Lipolytic, Hypertrophied.

I. INTRODUCTION

It is well known that after unilateral nephrectomy, the remaining kidney is compensatory hypertrophied. A huge amount of literature is devoted to this issue, which emphasizes the theoretical and practical significance of this issue. The method of unilateral nephrectomy was used to study the basic laws of compensation for the function of paired organs. Unilateral nephrectomy is one of the most common operations in the surgical treatment of kidney disease.

There are very few works devoted to the complex accounting of renal release of hydrolytic enzymes after nephrectomy, and the task of this part of the study was to study the effect of unilateral nephrectomy on the content of amylase, lipase, and pepsinogen in the blood and their secretion by the salivary glands, kidneys under basal (fasting) and stimulated conditions. giving food stimuli to the increment of these enzymes by the digestive glands.

The aim of the study was to study the mechanisms of transformation of the enzymatic spectrum of saliva and to establish the real contribution of the salivary glands to the enzymatic homeostasis of the body in unilateral nephrectomy.

Research methods. In chronic experiments on animals, the secretion of individual enzymes by the salivary glands, their content in the blood after unilateral nephrectomy, under conditions of the basal secretion of the salivary glands, was studied. The experiments were performed on dogs with previously removed ducts of the salivary glands.

After unilateral nephrectomy, the secretion of enzymes in saliva and their content in the blood under conditions of basal secretion were recorded. During the experiment, blood was taken from a vein and saliva was collected by stimulating salivation with meat-rusk powder. The content of amylase, lipase and pepsinogen was determined in plasma and saliva.

II. RESEARCH RESULTS

Table 1 presents data on the effect of unilateral nephrectomy on the content of enzymes in the blood under conditions of the basal secretion of the digestive glands, which are sources of hydrolases incremented into the blood. As can be seen from this table, unilateral nephrectomy affects the content of amylase, pepsinogen and lipase in the blood ambiguously.

Table 1. The effect of unilateral nephrectomy on the content of enzymes in the blood (on an empty stomach)

Dog names	Amylase (units / ml)		Lipase (units / ml)		Pepsinogen (units / ml)	
	1	2	1	2	1	2
Weasel	4,9±0,4	6,6±0,6*	0,6±0,05	0,5±0,04	11,1±1,0	14,9±1,3*
Bobby	5,7±0,5	6,6±0,6	0,7±0,06	0,6±0,05	16,2±1,5	17,9±1,6
Tarzan	4,8±0,4	6,6±0,5*	1,1±0,1	0,9±0,1	12,5±1,4	17,8±1,6*

Note: * - reliability of difference (> 0.05);

-1 - before nephrectomy;

-2-after nephrectomy;

After unilateral nephrectomy under conditions of basal secretion in two dogs (Laska, Tarzan), amylolytic activity and pepsinogen content significantly increased. In the third dog (Bobby), they remain at the level of the original values.

The blood lipolytic activity in experimental dogs after unilateral nephrectomy remains unchanged. This means that the performed unilateral nephrectomy not only affects the excretion of enzymes by the kidneys, but also affects the increment of enzymes by the digestive glands.

From the data presented in Table 2, it can be seen that after unilateral nephrectomy in experimental animals, the volume of the basal secretion of the salivary glands, in the dog Tarzan - of the parotid gland, Laska - of the submandibular and sublingual salivary glands, increases.

Table 2. Effect of unilateral nephrectomy on basal secretion enzymes by the salivary glands

Nicknames dogs	Salivary glands	Saliva volume ml / min		Amylase (x100)		Lipase		Pepsinogen	
		1	2	1	2	1	2	1	2
Weasel	OK	0,11±0,0 04	0,12±0,0 03	$\frac{5.9 \pm 0.6}{0.6 \pm 0.1}$	$\frac{7.7 \pm 0.5^*}{0.9 \pm 0.1^*}$	$\frac{12,6 \pm 0,6}{1,3 \pm 0,05}$	$\frac{11,8 \pm 0,6}{1,4 \pm 0,06}$	$\frac{16,3 \pm 1,7}{1,7 \pm 0,4}$	$\frac{18,4 \pm 1,8}{2,2 \pm 0,5}$
	Under	0,30±0,0 1	0,33±0,0 1*	$\frac{2,7 \pm 0,4}{0,9 \pm 0,2}$	$\frac{3,6 \pm 0,5}{1,2 \pm 0,3}$	$\frac{15,1 \pm 0,8}{4,7 \pm 0,3}$	$\frac{15,7 \pm 0,9}{5,2 \pm 0,4}$	$\frac{23,1 \pm 2,4}{7,2 \pm 0,7}$	$\frac{24,9 \pm 2,1}{9,5 \pm 0,8^*}$
Bobby	OK	0,12±0,0 03	0,13±0,0 04	$\frac{6.1 \pm 0.4}{0.7 \pm 0.1}$	$\frac{7.9 \pm 0.6^*}{0.95 \pm 0.1^*}$	$\frac{13,2 \pm 0,7}{1,4 \pm 0,06}$	$\frac{14,4 \pm 0,8}{1,5 \pm 0,07}$	$\frac{17,1 \pm 1,8}{1,9 \pm 0,5}$	$\frac{19,6 \pm 1,6}{2,5 \pm 0,6}$
	Under	0,31±0,0 1	0,33±0,0 1	$\frac{2,9 \pm 0,5}{1,0 \pm 0,2}$	$\frac{3,3 \pm 0,5}{1,1 \pm 0,2}$	$\frac{15,7 \pm 1,0}{5,1 \pm 0,5}$	$\frac{15,9 \pm 1,0}{6,1 \pm 0,7}$	$\frac{25,6 \pm 1,9}{7,4 \pm 0,8}$	$\frac{29,6 \pm 1,4}{9,8 \pm 0,9}$

Tarzan	OK	$0,10 \pm 0,03$	$0,12 \pm 0,04^*$	$\frac{6,3 \pm 0,6}{0,7 \pm 0,1}$	$\frac{8,2 \pm 0,6^*}{0,98 \pm 0,1^*}$	$\frac{13,4 \pm 0,6}{1,4 \pm 0,07}$	$\frac{14,1 \pm 0,7}{1,7 \pm 0,1^*}$	$\frac{17,4 \pm 1,6}{2,0 \pm 0,4}$	$\frac{19,6 \pm 1,4}{2,3 \pm 0,5}$
	Under	$0,33 \pm 0,01$	$0,32 \pm 0,01$	$\frac{3,1 \pm 0,6}{1,1 \pm 0,3}$	$\frac{3,9 \pm 0,6}{1,2 \pm 0,3}$	$\frac{16,3 \pm 0,9}{5,2 \pm 0,4}$	$\frac{15,8 \pm 0,7}{5,0 \pm 0,5}$	$\frac{24,4 \pm 1,9}{7,7 \pm 0,6}$	$\frac{31,4 \pm 2,1^*}{10,0 \pm 0,8^*}$

Note: - numerator enzyme content unit / ml; - the denominator of the release of the enzyme units / min;

* - reliability of the difference; ok - parotid salivary gland; sub - submandibular and sublingual salivary gland; -1- before nephrectomy; -2- after nephrectomy.

In the Bobik dog, the volume of basal secretion of the salivary glands after unilateral nephrectomy remains at the initial level.

Unilateral nephrectomy on the enzyme spectrum of saliva is ambiguous. In all experimental dogs, after nephrectomy, amylolytic activity and its debit increase in the saliva of the parotid salivary gland. In the submandibular saliva with the sublingual salivary glands, the amylolytic activity and its flow rate, after unilateral nephrectomy, remain at the level of the initial values.

There is a unidirectional change in the amylolytic activity of blood and its secretion by the salivary glands, this proves the participation of the salivary glands in maintaining enzymatic homeostasis by incrition and recreation, especially amylase.

Our results of a correlation analysis between the content of amylase in the blood and its release in saliva showed that the correlation coefficients for the saliva of the parotid gland were always higher than for the saliva of the submandibular and sublingual glands. These results confirmed the literature data [1, 2] that in the composition of the saliva of the parotid, submandibular and sublingual glands, the ratio of S-, P- amylolytic activity is observed in parotid saliva S - 55-67%, P - 33-44%, and in the submandibular and sublingual saliva S - 79%, P - 21%.

Hence, we can conclude that the parotid salivary gland can recruit more β -amylase from the blood than the submandibular and sublingual salivary glands.

In all experimental animals after unilateral nephrectomy, the content of pepsinogen in the saliva of all salivary glands tends to increase, but these changes are not significant. In two dogs (Laska and Tarzan) out of three, the release of pepsinogen in the saliva of the submandibular and sublingual salivary glands significantly increased (Table 2). The correlation coefficients between the content of pepsinogen in the blood and its excretion by the salivary glands were high and positive. This means that there is a direct dependence of the release of pepsinogen by the salivary glands on the level of its content in the blood. These results confirmed the literature data [3] that pepsinogen in saliva has a recreational nature; it is secreted from the blood by the salivary glands. Pepsinogen is secreted into the blood by the main cells of the gastric glands.

From the foregoing, we can conclude that unilateral nephrectomy stimulates the increment of pepsinogen by the gastric glands, and, accordingly, enhances its recreation from the blood by the salivary glands.

After unilateral nephrectomy, the basal lipase secretion by the salivary glands remains unchanged. Only one dog (Tarzan) showed an increase in the release of lipase in the saliva of the submandibular and sublingual glands. This is most likely the result of increased salivation by these glands.

Correlation analysis showed that there is a direct relationship between the lipase content in the blood and its secretion by the salivary glands. We consider this as an argument confirming the recreational nature of lipase in saliva.

After unilateral nephrectomy, under conditions of basal secretion of dogs, amylolytic activity and the content of pepsinogen in the blood increase or remain at the level of the initial values, while its lipolytic activity remains unchanged. This means that unilateral nephrectomy stimulates the increment of pepsinogen and amylase by the gastric and pancreas, and, accordingly, enhances their recreation from the blood by the salivary glands.

After unilateral nephrectomy, there is a direct dependence of the content and, especially, the release of amylase in saliva, on the level of its excretion in the urine. The correlation coefficients of parotid saliva are much larger and more reliable than those of the submandibular and sublingual glands. The reason for this may be the following phenomenon, firstly, homeostasis of amylase in the

blood is provided by the kidneys and salivary glands, an increase in the content of amylase in the blood after unilateral nephrectomy led to an increase in its excretion in the urine and saliva.

After unilateral nephrectomy, lipolytic activity in the blood and its secretion by the salivary glands remains unchanged. But the content and, especially, the excretion of lipase in the urine after unilateral nephrectomy significantly decreases. These multidirectional changes in lipase secretion by the salivary glands and with urine led to the fact that the Tarzan dog had negative correlation coefficients between lipase secretion by the salivary glands and urine. This means that the salivary glands to a certain extent compensate for the insufficient work of the kidney in the homeostasis of the lipase enzyme.

After unilateral nephrectomy in experimental dogs, the content of pepsinogen in the blood increases and, accordingly, this led to an increase in its release in the saliva of the submandibular and sublingual salivary glands. The correlation coefficients between the content and excretion of pepsinogen by the salivary glands and in the urine are generally positive and low.

Food stimulation, after unilateral nephrectomy, regardless of the type of stimulus, stimulates the secretion of amylase by the salivary glands; it did not affect lipolytic activity and lipase debit, the release of pepsinogen in the saliva of the submandibular and sublingual salivary glands.

One direction of the change in the release of amylase in the saliva of the parotid gland and urine, after unilateral nephrectomy, under conditions of stimulation of incretion of enzymes, shows that both the parotid salivary gland and the remaining one kidney play a role in blood amylase homeostasis.

There is an interdependence between the submandibular, sublingual salivary glands and, after nephrectomy, one kidney in maintaining pepsinogen homeostasis. Hence, we can conclude that the salivary glands, as it were, "specialized" in maintaining enzyme homeostasis, if the parotid salivary gland is more involved in maintaining the constancy of amylase and lipase, and the submandibular and sublingual salivary glands maintain the constancy of pepsinogen in the blood more.

Hence, it can be concluded that homeostasis of various enzymes reacts ambiguously to a decrease in renal excretory function, i.e. the role of the kidneys in maintaining homeostasis of various enzymes is not the same. In terms of the importance of the kidneys in maintaining enzymes, the position is unequal, pepsinogen is in the first place, amylase is in second place, and lipase is in last place. Therefore, when the excretory function of the kidneys is impaired, the content of pepsinogen in the blood increases most of all, and then amylase, and the lipase content remains unchanged.

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