الهضم فى جدار أمعاء الجمل
تقدير كمية الاميليز، واللايبيز، والفوسفاتيز القاعدى
فى الجدار المخاطى للامعاء

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سناء نصار ، سعاد ٠ ع ٠ منصور

كان الاس الحامضى لجدار الامعاء المخاطى فى انتفاخ الاثنى عشر ، والاثنى عشر
واللفائفى يميل قليلا الى الحامضية ٠ وكان ثابتا الى حد ما فى الأجزاء الثلاثة ٠
ثبت وجود الفوسفاتيز القاعدى ، واللايبيز فى الجدار المخاطى المعـــوى
بـ ٢٥٫٧٢ وحدة فى انتفاخ الاثنى عشر، ٤٨٫٣٩ وحدة فى الأثنى عشر ٤٧٫٤٥ وحدة
فى الجزىء العلوى من اللفائفى ٠ وكان مقدار نشاط اللبيز ٤٣٫٠ وحدة لانتفاخ
الاثنى عشر ٧٧٫٠ وحدة للاثنى عشر ٦٧٫٠ وحدة للجزىء العلوى من اللفائفى ٠
وقد اتبع الاميليز نفس ظاهرة توزيع الفوسفاتيز القاعدى واللايبيز حيث كانت كمية
نشاطه فى انتفاخ الاثنى عشر تقريبا نصف كمية نشاطه فى الأثنى عشر
والجزىء العلوى من اللفائفى ومقداره هو ٢٣٫٨٧، ٤٥٫٩٦، ١٣٫٥٥ وحدة
على الترتيب ٠

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INTESTINAL MUCOSAL DIGESTION IN CAMELUS DROMEDARIUS
I-ESTIMATION OF AMYLASE, LIPASE
AND ALKALINE PHOSPHATASE IN MUCOSAL HOMOGENATE.
(With One Table)

By

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SUMMARY

The pH determination of the mucosal homogenate
in ampulla duodeni, duodenum proper and in the
upper part of the jujenum in camelus dremoda-
rius demonestrated slight acidity and more or
less constancy through out the mucosal wall of
the three segments. The mucosal homogenate de-
monstrated the presence of alkaline phospha-
tase, lipase and amylase. The mean total ac-
tivity of alkaline phosphatase per weight cen-
timeter square of mucosa was 25.72 Units in
ampulla duodeni, 48.39 Unit in the duodenum
and 47.45 Unit in the upper part of the juje-
num. For lipase, the activity was 0.43 Unit in
the ampulla duddeni, 0.77 for the duodenum
proper and 0.67 Unit for the upper part of the
jujenum. Similar to lipase and alkaline phos-
phatase enzymes, the activity of the amylase
in ampulla duodeni was half of the duodenum
and upper part of the jujenum. It was found to
be 23.87, 45.96 and 55.13 Units respectively.

INTRODUCTION

There were many experimental data which do not agree with
the classical scheme of intestinal digestion. During starch
hydrolyses in the intestine only dextrine of different sizes
was observed in the lumen, where in the same time glucose was
demonestrated in blood (UGOLEV and MARAUSKA, 1964). By intro-
duction of protein and protein with mixture of amino acids in

the intestine, the rate of peneteration of amino acids to the blood do not depened upon whatever the amino acid were given in free form or as a protein (CRANE and NEUBERGAR, 1960).

SCHOROPOVA (1968) demonestrated that the intestinal mucous memberane has its own enzymes activities and are capable of hydrolysing substrate. This process of intestinal wall digestion or membrane digestion has been established to be carried not only by the wall of the intestine but also by the mucosa of the forestomachs in sheep and goats.

Still many efforts are needed for the demonstration of the collections of enzymes associated with intestinal wall and estimation of their activities in order to visualise the quantitative magnetitude of this process, especially in our domesticated animals among them camelus dromedarius is still not fully studied.

The aim of this work is to estimate the presence of amylase, lipase and alkaline phosphatase; playing a major role in the processes of hydrolysis and absorption of the metabolites; in the upper third of the small intestine of camelus dromedarious.

MATERIALS AND METHODS

The proximal part of the small intestine, amuplla duodeni, duodenum and upper part of the jujenum, was collected from 20 male camels from the slaughter house. The intestinal contents were evacuated and the samples were transfered to the laboratory in ice box.

The mucosal surface was washed gently and throughly with physiological saline. A measured area of the mucosa from each segment was pealed off using a glass slide. The weight of pealed mucosa was recorded.

Homogenization of the pealed mucosa was carried out with glass homogeniser. The pH of the mucosa in each segment of the intestine was measured. The homogenate was extracted in phosphate buffer solution of pH 7 for 24 hours in refregerator. The extract was centrifuged at 2500 round per minute for 10 minutes. The enzymatic activities were measured in both the supernatent fluid and sediment.

The amylolytic activity was measured by the modified SOMOGYI method (1938). The lipolytic activity was estimated by the method CHERRY and GRANDALL (1932). The alkaline phosphatase activity was evaluated according to the method of BESSEY et al. (1946).

The activity of the enzymes estimated per gram mucosa was calculated for the weight of each centimeter square mucosa.

RESULTS AND DISCUSSION

The results are demonestrated in table (1). The pH determination of the mucosal homogenate in the ampulla duodeni, duodenum proper and in the upper part of the jujenum. The mean pH in the ampulla duodeni was 6.1, in the upper part of the jujenum, 6.3.

These results agreed with the general data of pH in ruminant where it was established to be 6.5 in the duodenum (KORILOV and KROTKOVA,1971). This slight acidity of the upper part of the small intestine was interpreted as of physiological significance. It influences the abomasal secretion (ASH,1961);extends the medium of activity of abomasal pepsin;

stimulates the pancreatic secretion and regulates the secreation of proteolytic enzymes (MAGEE, 1961).

There was a difference between the pH of the mucosal homogenate of the intestine and the pH of the intestinal content in camel. This was demonestrated in a previous work by NASSAR (1971) where the mean pH of the ampulla duodeni content was 5.3 and in the duodenum. 6.4. The pH of the content increases towards alkalinity unitll it reached 8.2 in the jujenum. LENNOX and GARTON, (1968) stated that the acidic chyme of the abomasum influences the pH of the upper third of the intestine. The neutrality of the pH is reached only at the lower jujenum due to bicarbonate secretion.

There was more or less constancy of the pH in the mucosal homogenate of the three segments. The difference in the pH from the ampulla duodeni to the upper part of the jujenum was 0.2 Unit. MAK-LAREN and BEBKOK (1962) and KOLDCVSKY et al (1965) stated that the optimal pH for the adsorbed enzymes on a biological surface deviates for 1.5 : 2 Units and slightly depends on the pH of the surounding solutions. The constancy of pH enables constant and optimum activity of the adsorbed enzymes in intestinal mucosal digestion in contrary to the soluble enzymes in intestinal juice which are harmfully affected by the pH variations.

The presence of alkaline phosphatase enzyme in the mucosa of camel upper small intestine was demonestrated in this work. The mean total activity of the enzyme per weight of square centimeter mucosal homogenate was 25.72 Unit in the ampulla duodeni; 48.39 Unit in the duodenum and 47.45 Unit in the upper part of jujenum.

MIKHLIN, (1955) stated that alkaline phosphatase is secreated mainly in the upper segment of the small intstine. Although alkaline phosphatase is not specific intestinal

enzyme, but its concentration in the mucous membrane of the small intestine is 30-40 time larger than its concentration in the liver and pancreatic tissue. In the intestinal digestion the alkaline phosphatase splits the phosphates from monoesters of phosphoric acid and play a significant role in the phosphorylation of carbohydrates fat and shares in the process of amino acids absorption (KORILOV & KROTKOVA, 1971) Alkaline phosphatase localises in the mucous membrane of the small intestine in the epithelial cell layer of the velli and are distributed mainly in the apical part of the epithelial cells (DEMPESY and DEANE, 1946). This localisation of alkaline phosphatase on the absorbative surface cell was regarded by NATURA and WAKOBOYASHI, (1957) as a manifistation of its role in the processes of absorption. It is also suggested that alkaline phosphatase has a large significance in the transport of the organic substances through the cellular membranes (NOVIKOV, 1957).

The mean total activity of lipase enzyme of the weight of centimeter square intestinal mucosal homogenate was found to be 0.43 Unit in the ampulla duodeni. The activity of this enzyme in the duodenum and upper part of the jujenum was 0.77 and 0.67 Units nearly double as that of ampulla duodani.

Lipase was found in duodenal juice by PHANEUF, (1957); ALLEV and ASHIRVO (1965) and GARTON (1969). These authors stated that inspite of this, the major lipolytic hydrolyses takes place mainly in middle and lower jujenum in sheep.

Similar to lipase and alkaline phosphatase enzymes, the activity of the amylase in the ampulla duodeni was half of the duodenum and the upper part of the jujenum. This was found to be 23.87; 45.96 and 55.13 Units respectively of

the weight of one centimeter square of the mucosal homogenate of the ampulla duodeni, duodenum and jujenum.

HEMBRY, BELL and HALL (1967) demonestrated the presence of amylase activity in the three regions of the small intestine (duodenum, jujenum and ilium) but the highest level of amylase was found in the jujenum. On the contrary WRIGHT, GRAINGER and MARCO (1966) stated that the major part of starch digestion entering the small intestine was vertually completed in the first third of the tract. NASSAR,(1971) estimated the amylolytic activity in the content of the small intestine of camel and demonestrated that the maximal potency is the same in the duodenum, jujenum and the ilium However the ampulla duodeni this amylolytic activity is significantyl much less than observed in the other segments of the small intestine.

It is clear that the activity of alkaline phosphatase; lipase and amylase in the mucosal homogenate of the ampulla duodeni of camel is nearly half the activity of those enzymes in the duodenum and upper part of the jujenum. Also the concentration of these enzymes in the last two segment is more or less the same. An explanation may be provided by the fact that this organ is a transitional organ between the pylorus and the duodenum as the mucous membrane changes in histological structure progressively from that of the pylorus to that of the duodenum (DELLMANN; BLIN and FAHMY; 1968).

The presence of the alkaline phosphatase, lipase and amylase in the intestinal homogenates of the mucosa of ampulla duodeni, duodenum and upper part of the jujenum together with the estimation of the activity of this enzyme per centimeter square of mucosa is a representative normal physiological data for the processes of intestinal mucosal digestion in camel.

WILSON, (1962) established the localisation of enzymes amylase, lipase and alkaline phosphatase in the zone of the brush border of the intestinal mucosa and emphasized their part in intestinal mucosal digestion.

The adsorbed enzymes activity is ten time larger than the soluble one (LI, and LI,1962). This increased activity is quantitative rather than qualitative which is explained KORILOV and KROTKOVA to be due to the following factors: The hugh area of the micro villi in the zone of the brush border of the intestinal epithelium to which the enzymes are associated. The substrate introduced between the microvilli of the brush border is surounded from three sides by enzymes. According to physical laws, the molecules in solution phase (intestinal juice) when comes in contact with solid phase (epithelial membrane)possesses higher energy and thus required less enzymatic energy for the splitting. Finally the association of substrate hydrolyses and absorbtion on mucous membrane condition regular and constant removal of hydrolysates which-according to both lows of mass action - inhance the splitting function of the enzyme.

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Table (1)

← PH and enzymatic activity of intestinal mucosa in camel.

Part of Intestine	Mean PH			Alk. phosphatase in Units							Lipase activity in Units							Amylase active in Units						
	Min	Max	PH	Fluid part Min Max		Sedimented part Min Max		The total activity per Wt. of Cm²			Fluid part Min Max		Sedimented part Min Max		The total activity per Wt. of Cm²			Fluid part Min Max		Sedimented part Min Max		The total activity per Wt. of Cm²		
Ampulla duodeni	5.8	6.3	mean 6.07 ±3.87	8.11	34.99 mean 18.73 ±2.39	7.45	86.4 mean 32.71 ±8.05	25.72			0.12	2.24 mean 0.41 ±0.15	0.15	1.00 mean 0.41 ±0.09	0.13			14.81	59.00 mean 27.56 ±4.36	14.3	26.67 mean 20.18 ±1.44	23.87		
duodenum	5.8	6.6	mean 6.2 ±4.24	8.1	116.28 mean 43.37 ±11.09	19.8	133.38 mean 53.42 ±8.29	48.39			0.18	1.66 mean 0.85 ±0.17	0.05	2.7 mean 0.69 ±0.18	0.77			17.74	105.6 mean 50.78 ±6.96	17.6	76. mean 41.13 ±4.69	45.96		
upper part of jujenum	6.2	6.6	mean 6.3 ±2.65	62.5	16.4 mean 50.37 ±5.2	95.04	16.4 mean 44.52 ±11.49	47.45			0.15	1.31 mean 0.76 ±0.17	0.25	1.22 mean 0.57 ±0.16	0.67			26.88	88.98 mean 64.64 ±11.56	19.56	60.13 mean 45.61 ±6.22	55.13		