ENDOCRIN STATUS IN HEALTHY SUKLING PIGLETS AND DIARRHOEA PIGLETS IN THE FIRST DAYS OF LIFE

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Abstract: *The experiment was carried out with 27 piglets from birth to the age of three days, of which 11 healthy piglets and 16 piglets with diarrhoea. All piglets were weighed. In piglets with diarrhoea, the blood was collected in the day when the diarrhoea started. After the serum was examined, it was separated and preserved by freezing up to the moment of hormone dosage. The cortisol and insulin concentration was measured with a HPLC. The glycaemia was measured with an Accucek device. The data obtained were processed statistically through a non-parametric test, the Mann Whitney U Test. Body weight measurements in piglets suffering from diarrhoea and healthy piglets showed that diarrhoea piglets display a lower average body weight starting with the first day of diarrhoea, thus the difference in body weight can not be accounted to dehydration. Glycaemia in piglets with diarrhoea is, starting with the first day of diarrhoea, significantly lower ($p<0.05$) than healthy piglet glycaemia; similarly, the level of serum insulin ($p<0.05$) as well as that of serum cortisol ($p<0.001$) are lower in diarrhoea piglets. What is more, the serum level of the insulin does not correlate significantly with glycaemia ($r=0.27$; $p>0.05$), from a statistic point of view. The serum cortisol does not correlate significantly in healthy piglets ($r=0.071$; $p>0.05$), statistically, and also not in diarrhoea piglets ($r=0.46$; $p>0.05$). On the contrary, there is a strong correlation of the serum insulin with the serum cortisol in healthy piglets ($r=0.86$; $p<0.001$) as well as in diarrhoea ones ($r=0.92$; $p=0.0000$). The reduction of the serum cortisol level in diarrhoea piglets can represent a facilitating factor in the diarrhoea pathogenesis, or it can be the consequence of subnutrition and diarrhoea.*

Key words**:** *piglets, glycaemia, insulin, cortisol*

INTRODUCTION

Intestinal tissue growth, development and maturation are achieved during the first life days under nervous and humoral control. Because at birth the central and enteric nervous system are immature, the intestine growth and development is regulated compensatory through growth factors in colostrum and milk.

The cortisol secretion increases before birth, reaches a maximum level at birth (193±13 nM) (5) and then decreases brutally during the first life week. With newly-borns the plasmatic insulin level is of 10-18.3 μmol/ml, its local role being to stimulate protein synthesis (1,2,3,4).

The present experiment intends to dose cortisol and insulin in the blood serum of healthy piglets and of piglets suffering from diarrhea during the first life days, correlated with the glycaemia level.

MATERIAL AND METHODS

The experiment was carried out on 27 piglets from birth until three days of age, of which 11 healthy piglets and 16 piglets with diarrhoea. All piglets were weighed.

In piglets with diarrhoea blood was harvested on the day diarrhoea was triggered. Blood harvesting was done with jugular confluent, in vacuum containers without anticoagulant; after the serum was expressed, it was separated and frozen until the hormone dosage.

Cortisol and insulin concentration measurement was done using a HPLC – Shimadzu LC-20 AD device with a LC-20 AD delivery pump with a 6 valve port-injector (Rheodyne 7725), injector with 20 µl loop volume, SPD-M-20 M Shimadzu detector.

Glycaemia was measured with an Accucek device. The blood sample was harvested through auricular vein puncture; no blood was harvested from piglets stressed during contention because it causes hyperglycaemia.

The data obtained was statistically processed with the help of the nonparametric Mann Whitney U Test.

RESULTS AND DISCUSSIONS

The average body weight of piglets suffering from diarrhoea, weighed on the day when diarrhoea was triggered, was lower than 34.28 %; 10.07 %; 17.18 % and respectively 11.85 % for the ages: < 24 hours, 1 day, 2 days and respectively 3 days (table 1, figure 1); these differences generally show that, given the lower body weight (with an average of 10.55 %), these piglets are less vigorous and have lost the competition for a mamma richer in milk; consecutively they present a lower colostrum/milk consumption.

Table 1

Serum insulin, serum cortisol, glycaemia and body weight values in healthy and diarrhoea piglets from birth till three days of age

Vârsta	**Insulin (µg/ml)**		**Cortisol (µg/ml)**		**Glycaemia (mg %)**		**Body weight (g)**	
< 24 hours	sănătos	cu diaree	sănătos	cu diaree	sănătos	cu diaree	sănătos	cu diaree
	5,1	4,3	51	45	105	79	1785	1034
	5,6	4,7	53	47	135	80	1945	1108
	5,4	5	55	50	127	95	1672	1408
Mean	**5,36±0,18**	**4,66±0,25**	**53±1,33**	**47,33±1,78**	**122,33±13,22**	**84,66±6,89**	**1800,66±96,66**	**1183,33±149,44**
1 day	5,1	4,8	52	49	110	90	1655	1396
	5,6	4,4	55	48	136	109	1482	1656
	5	4,9	51	48	130	41	1682	1327
	5,4		54		81		1673	
Mean	**5,27±10,22**	**4,7±0,20**	**53±1,50**	**48,33±0,44**	**114,25±18,75**	**80±26**	**1623±70,5**	**1459,66±130,09**
2 days	6,3	4,5	57	48	113	112	2534	1709
	5,5	4,8	53	50	117	108	1882	1668
		5,2		51		112		2768
		5,8		53		92		1816
		5		51		83		1182
Mean	**5,9±0,40**	**5,06±0,37**	**55±2,0**	**50,6±1,28**	**115±2,0**	**101,4±11,52**	**2208±326,0**	**1828,6±375,76**
3 days	6,1	5,4	56	53	116	95	2056	2053
	5,7	4,9	55	49	117	94	2540	1735
		4,8		49		108		1806
		5,3		52		140		2158
		5,8		54		117		2377
Mean	**5,9±0,20**	**5,24±0,23**	**55,5±0,5**	**51,4±1,88**	**116,5±0,5**	**110,8±18,52**	**2298±242,0**	**2025,8±204,36**
n	**11**	**16**	**11**	**16**	**11**	**16**	**11**	**16**
Mean	**5,53±0,22**	**4,97±0,29**	**54,73±0,94**	**49,81±1,40**	**117,00±18,75**	**97,18±15,55**	**1900,54±106,87**	**1700,06±233,85**
%	**100**	**89,87**	**100**	**91,01**	**100**	**83,06**	**100**	**89,45**

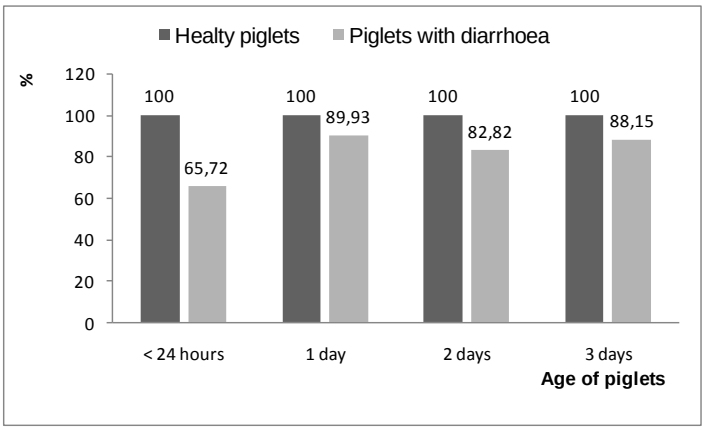

Figure 1: Percentage values of body weight in piglets suffering from diarrhoea and healthy piglets in the first three days of life comparatively

Average glycaemia in healthy piglets was of 117±18.75 mg % and those suffering from diarrhoea, 97.18±15.55 mg %, statistically significant ($p<0.05$), lower than in healthy piglets. Taking the age into account, the percentage difference of piglet glycaemia was highest at the age of < 24 hours (cu 30.79 % less) (figure 2), a difference which decreases as the piglets get older: with 4.89 % at the age of 3 days; we can infer the reduction of the ingested colostrum/milk quantity and respectively a quicker exhaustion of the glycogen reserve in younger piglets.

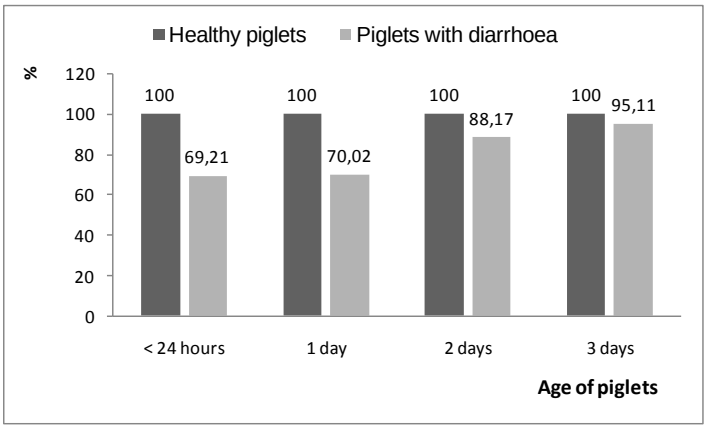

Figure 2: Percentage values of glycaemia in piglets suffering from diarrhoea and healthy piglets in the first three days of life comparatively

With all piglets suffering from diarrhoea, insulinemia was lower than in healthy piglets; the average insulinemia in piglets suffering from diarrhoea represented 89.87 % of the insulinemia value in healthy piglets (figure 3); statistically, this difference is significant ($p<0.05$).

In healthy piglets insulin and glycaemia levels are correlated positively ($r=0.86$), the correlation is very strong and statistically significant ($p<0.001$) (table 2).

In diarrhoea piglets, the correlation of insulinemia with glycaemia is highly reduced (r=0.27) and statistically insignificant; there is a possibility that insulinemia be reduced due to the decrease of glycaemia in piglets with diarrhoea, since the insulin secretion is glycaemia dependent.

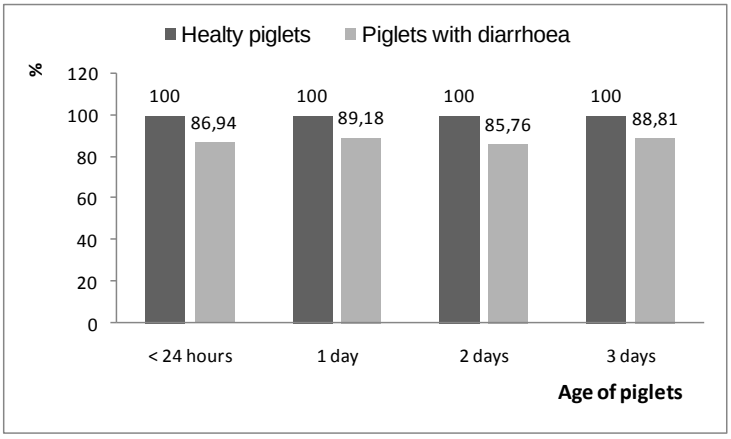

Figure 3: Percentage values of serum insulin in piglets suffering from diarrhoea and healthy piglets in the first three days of life comparatively

Table 2

Correlation coefficient of serum glycaemia, serum insulin and serum cortisol on healty piglets and piglets with diarrhoea in the first three days of life

	Healty piglets		Piglets with diarrhoea	
	Spearman r	p	Spearman r	p
Insulin/Glycaemia	0,86	p<0,001	0,27	NS, p>0,05
Cortisol/ Glycaemia	0,071	NS, p>0,05	0,46	NS, p>0,05
Insulin/ Cortisol	0,86	p<0,001	0,92	p=0

NS – insignifiant

Also, the serum cortisol level is lower in piglets suffering from diarrhoea (with an average of 8.99 %) (figure 4), statistically significant, lower than in healthy piglets (p<0.001); although in healthy piglets, the highest cortisol level was observed immediately after birth, brutally decreasing after 3-4 days of life, in piglets with diarrhoea the lower level is similar to the level in premature piglets.

Given the major role of cortisol in intestine growth and development, in the current case we cannot say whether diarrhoea facilitates the serum cortisol decrease or the low nutritional level or whether the disease state (diarrhoea) is the cause of its reduction; it is not statistically correlated with healthy piglets glycaemia (r=0.071) and it is poorly correlated with the glycaemia of piglets suffering from diarrhoea (r=0.46), but statistically insignificant.

Between the serum level of insulin and cortisol there is a close statistically significant correlation, in healthy piglets (r=0.86; p<0.001) as well as in those suffering from diarrhoea (r=0.92; p=0.0000).

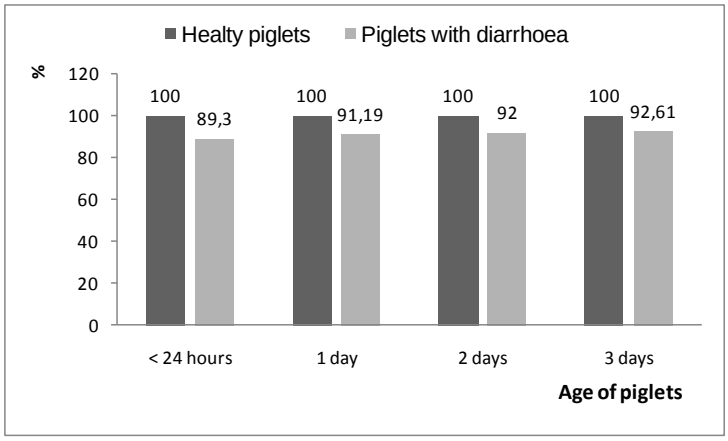

Figure 4: Percentage values of serum cortisol in piglets suffering from diarrhoea and healthy piglets in the first three days of life comparatively

CONCLUSIONS

Diarrhoea from the first days of life was triggered in piglets with a 34,28 % lower body weight in the first 12 hours and 11,85 % lower in three days old piglets, in comparison with healthy piglet.

Average glycaemia of healthy piglets during the first three days of life was of 107± mg %, and in diarrhoea ones of 97.18± mg %, a statistically significant difference ($p<0.05$); the greatest differences were registered in piglets less 24 than hours old and decreased before three days of age.

In diarrhoea piglets, the serum insulin level was significantly lower ($p<0.05$) than in healthy piglets. The level of the serum insulin correlates positively ($S=0.86$) and statistically significant ($p<0.001$) with glycaemia; in diarrhoea piglets, the insulin correlates weakly ($S=0.27$) and statistically insignificant ($p<0.05$) with glycaemia.

Serum cortisol in diarrhoea piglets is significantly lower ($p<0.001$) than in healthy piglets; it does not correlate with glycaemia ($p>0.05$), but it correlates closely and statistically significant with serum insulin, in healthy ($S=0.86$; $p<0.001$) as well as in diarrhoea piglets ($S=0.92$; $p=.0000$). Serum cortisol reduction in diarrhoea piglets can be a facilitating factor in diarrhoea triggering or it can be the consequence of subnutrition and diarrhoea.

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