I. SOME BIOCHEMICAL CHANGES IN THE BLOOD OF PIGLETS WITH POST WEANING DIARRHOEA SYNDROME (PWDS)

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The method of weaning at 21 day of the life of the piglets, is the most profitable for the increase of productivity in the swine industry today (Cunha, 1978; Katsaounis, 1980). However, because of many factors related either with the piglet itself or with the environment, the end result of the above method, is very often the development of the non infectious diarrhoea (Brent et al, 1975; English et al, 1978) due to the stress of weaning and, at a later stage, of the PWDS due to bacteria, virus and protozoa complications (Kyriakis, 1981).

This syndrome is one of the most important factors, from the production cost point of view that the industry must very serious take into consideration (Bourne, 1979; Kyriakis, 1981).

The most common infectious complications are related with enteropathogenic *E.coli* and *rotavirus* and this cause to the host animal increased fluid and electrolyte secretion from the small intestine (Brent et al, 1975; English et al, 1978; Moon, 1978; Bohl 1979 and 1980; Taylor, 1981). It is also well known that in the piglet under stress conditions, such as in our case, the supplementation of vitamin C can be beneficial (Cunha, 1977; Yen and Pond 1980).

Our study was carried out in Greece during 1977-79 and we investigated the biochemical changes in relation to the level of glucose in the blood, vitamin C, Na^+ and K^+ in the serum on clinical healthy piglets, 9 days post weaning (H group) and on piglets of the same age at the onset of PWDS (D group), caused by enteropathogenic *E.coli* and with the presence of *rotavirus*. All piglets in the trial were bred on the farm, had the same genetical potential, lived under the same management conditions and were weaned at the end of the 3rd week of the life. The diagnosis of the microbial complications of the naturally infected piglets with PWDS was based on clinical observations, post mortem examinations of all sacrificed pigs (one from each litter on trial) and laboratory examinations for: *E.coli*, *T.hyodysenteriae*, other *Treponema spp*, *Clostridia spp*, *Salmonellae spp*, TGE, *rotavirus*, *coccidia* and *B.coli*.

The levels of glucose, vitamin C, Na^+ and K^+, in the two groups of piglets are presented in the table I.

TABLE I

Levels of glucose in the blood, vitamin C, Na^+ and K^+ in the serum of healthy (H group - 4 litters) and ill piglets (D group - 4 litters) at the onset of PWDS.

Group of Anim. and No.	Av. age in days	Av. L.W. in kg	Glucose (mg/ 100 ml)	Vit. C (mg/ 100ml)	Na^+	K^+
					(mEq/l)	
H/30	30	5,213[a]	84,77[a]	1,938[a]	124,57[a]	4,72[a]
D/30	30	5,365[a]	65,53[b]	1,187[b]	101,28[b]	6,63[b]
		(1)	(2)	(2)	(2)	(2)

1. Means bearing the same superscripts are not significantly different.
2. Means bearing different superscripts are significantly different P<0.001 ("t" test)

The above results indicate that the onset of PWDS associated with biochemical changes of the blood parameters studied in this work. Affected animals had electrolyte imbalance and vitamin C and glucose disturbances. It should be noted, however, that blood glucose levels in healthy piglets is close to the "physiological" minimum, according to existing limited data (Pond and Houpt 1978).

These biochemical abnormalities provide a good guide for their correction which could be based either on a prevention basis, providing to the early weaned pigs supporting therapy or treating the animal at the onset of PWDS with the proper antibacterial agent in combination with glucose, sodium bicarbonate and vitamin C in the drinking water (Kyriakis, 1977; Cunha, 1977; English et al, 1978; Kyriakis, 1981).

Selected references: Bohl, E. H.; AVMA, 1979, 174, 613-615; Bohl, E. H.; 6th IPVS Congress, Proc. 1980, Copenhagen; Bourne, J.; Pig F, 1979, 27, 71-75; Brent, G., Hovell, D., Ridgeon, R. F., Smith, W. J.; Farming Press, 1975, Suffolk; Cunha, T. J.; Academic Press, 1977, N.Y.; Cunha, T. J.; F. Nov. 6th, 45-46, 1978; English, P., Smith, W., Maclean, A.; Farming Press, 1978, Suffolk; Katsaounis, N.; Univ. Press, 1980, Thessaloniki; Kyriakis, S.; Doctoral Thesis, Univ. of Thessaloniki, 1977, Greece; Kyriakis, S.; Post Doctoral Thesis, Univ. of Thessaloniki, 1981, Greece; Moon, H. W.; AVMA, 1978, 172, 443-448; Pond, W. G., Houpt, K.A.; Cornell Univ. Press, 1978, London; Taylor, D. J.; The Burlington Press, 1981, Cambridge; Yen, J.T., Pond, W. G.; 72nd An. Meeting of A.S.A.S. Proc. Ithaca, 1980, N.Y.

II. CONTROL OF THE POST WEANING DIARRHOEA SYNDROME (PWDS) OF PIGLETS WITH SUPPORTING THERAPY

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From present day data it is very obvious that the stress of early weaning of piglets at 21 day, can easily be the direct cause of PWDS. This syndrome continues to be one of the most important economic considerations for the swine industry in all over the world (Brent et al., 1975; Bourne, 1979; Kyriakis, 1981; Taylor, 1981). The aetiology is not simple and is related mainly with: a) the type and duration of stressors during the 2 week post weaning critical period, b) the status of the maturity of the digestive and immunity systems, c) the thermal relation of the piglet to its environment at the time of weaning and d) the opportunist pathogens that take advantage of the situation created by the above factors (English et al., 1978; Bohl, 1979 and 1980; Tzipori et al., 1980). For the development of PWDS different strains of enteropathogenic *E. coli* and *rotavirus* play, mainly, a very important role and cause to the host animals very high fluid and electrolyte secretion from the small intestine.

For the treatment of PWDS very little was done in the past for fluid and electrolyte replacement (Kyriakis, 1977; Elezoglou et al., 1978; Kruse and Nielsen, 1978; Bywater and Woode, 1980; Kyriakis, 1981). The aim of our research was to develop a special supporting therapy, given via the drinking water against PWDS cause by enteropathogenic *E. coli* (positive to the suckling mouse test, for the ST enterotoxin) and *rotavirus*. The presence of the *rotavirus* was documented by electromicroscopy in the diarrhoic faeces of the affected animals and was reported for the first time in Greece.

The solution of the supporting therapy had the following composition per litre of drinking water: glucose 20 g, sodium bicarbonate 2 g, vitamin C 0,06 g. The above therapy was given to a group of piglets weaned at 21 days with typical symptons PWDS, at the onset of the diarrhoea (T1 group) for 7 days in combination with an antimicrobial agent, that was found in the laboratory most sensitive against the isolated *E..coli* strains. Another group of piglets was given only the same antimicrobial agent (T2 group). The water with the two different medications during the 7 days of treatment was given without any restriction. Blood samples were collected at the end of the 7th day treatment period from both groups (T1 and T2).

The results of the treatment with (T1) or without (T2) the given supporting therapy are presented in the table I.

TABLE I

The results of the treatment with (T1) and without (T2) supporting therapy against PWDS.

Group and No.	Av. Age. in Days	Av. L.W. in kg: At the Start of the Tmt.	At the end of 7 day Tmt.	At the 14th day from the Start of the Tmt.	Feed Eff. During 14 days
T1/32	31,75	5,698[a]	6,002[a]	7,661[a]	48%[b]
T2/31	31,24	5,506[a]	5,113[b]	6,042[b]	16%[b]
		(1)	(2)	(2)	(2)

1. Means bearing the same superscripts are not significantly different.
2. Means bearing different superscripts are significantly different (P<0.001) ("t" test).

The results of biochemical examinations of the blood samples are presented in table II.

TABLE II

Levels of glucose in the blood, vitamin C, Na^+ and K^+ in the serum on treated with (T1) or without (T2) supporting therapy.

Group of Animals	Glucose (mg/100ml)	Vit. C (mg/100ml)	Na^+ (mEq/L)	K^+ (mEq/L)
T1	105,73[a]	1,939[a]	115,28[a]	5,36[a]
T2	81,88[b]	1,591[b]	100,78[b]	6,50[b]

Means in a column bearing different superscript letters are statistically significant at P<0.001

The group of piglets receiving the supporting therapy (T1) had better and faster control of their diarrhoea and sickness. During 14th day period, after the beginning of the medication, there was no mortality in either of the 2 groups of treated animals.

The clinical (table I) and biochemical (table II) results indicated very clearly the good response to this type of medication, against PWDS of early weaned piglets, at the age 21 day, caused by the stress of weaning and infectious complications of enteropathogenic *E. coli* and *rotavirus*.

Selected references: Bourne, J.; Fig. F. 1979, 27, 71-75; Bohl, E. H.; JAVMA, 1979, 174, 613-615; Bohl, E. H.; Proc., 6th IPVS Congress, 1980, Copenhagen; Brent, G., Hovel, D., Ridgeon, R. F., Smith, W. J.; Far. Press. 1975, Suffolk; Bywater, R. J. and Woode, G. N.; V.R., 1980, 104, 75-78; Elezoglou, V., Kyriakis, S., Andreotis, J.; Proc., 5th IPVS Congress, 1978, Zagreb; English, P., Smith, W., Maclean; Far. Press, 1978, Suffolk; Kyriakis, S.; Doctoral Thesis, U. of Thessaloniki, 1977, Greece; Kyriakis, S.; Post Doctoral Thesis, U. of Thessaloniki, 1981, Greece; Kruse, P.E., Nielsen, H. E.; Proc., Eur. Ass. An. Pr. 29th Meeting, 1978, Stockholm; Taylor, D. J.; The Burlington Press, 1981, Cambridge; Tzipori, S., Makin, M., Smith M., Chandeer, D.; Proc., 6th IPVS Congress, 1980, Copenhagen.