Probioties and new aspects of growth promoters in pig production

Mordenti A.

in

Aumaître A. (ed.).
The production of pig meat in Mediterranean Countries

Paris : CIHEAM
Options Méditerranéennes : Série Etudes; n. 1989-I

1989
pages 165-168

Probiotics and new aspects of growth promoters in pig production

Archimede MORDENTI

Istituto di Zootecnica e Nutrizione Animale - Bologna - Italy

The use in animal feeding of different substances capable of improving productive performances and health conditions has become widespread in all countries with advanced economies, which are usually marked by intensive breeding.

As a matter of fact, considerable progress has been made since 1946, when Moore et al. *determined that streptomycin fosters the growth of chicks, and when Stokstad and Jukes (1950), while studying vitamin B12 and APF, "re-discovered" the auxinic properties of antibiotics.*

Since then a great deal of research and experience on breeding has clearly shown that some substances, when added to feeds in small doses, have favourable effects on the growth of animals and on feed efficiency.

I - Auxinic antibiotics

Among these substances, commonly referred to as growth promoters, antibiotics play a leading role and are now systematically used in the feeding of growing-fattening pigs. Beside favouring the maintenance of good health conditions of the animals, these additives improve their performances. This occurs to an extremely varying extent, but in any case it is very interesting. Age and weight of the animals, hygienic conditions on the farm, quantity and quality of the feed can all affect the degree of the response. The benefits on growth are around 10-15% in piglets and go down to 2-5% in finishing animals. Feed efficiency also benefits from the presence of growth promoters in the diet: the advantages were about 5-10% in younger animals and 1-3% in fattening ones.

The first antibiotics used in animal production were of pharmacological origin (the so-called **first generation** auxinics with therapeutic activity which were potentially dangerous). After these, antibiotics with very low absorption (**second generation**, non-therapeutic) were studied and are now largely used. The risks they imply for the consumer are very limited or totally non-existent. Their zootechnical effectiveness, however, is undoubtedly valid and comparable with that of "first generation" auxinics.

Although the efficiency of antibiotics as growth promoters is beyond any doubt, and their use remains safe and quite justified, there are also other substances that can be considered as supplements or alternatives.

Among these, peptides and lactic bacteria should be mentioned as the main representatives of **third generation** auxinics.

II - Amino-acids and peptides

Dating from 1980, the results of our research proved the auxinic efficacy of amino-acids pools added to the diet in small doses and provided the interpretative foundation of phenomena that go

beyond proteic feeding according to classic patterns. In fact, the improved breeding performances found and confirmed by various researchers in pigs and other species cannot be ascribed solely to the specific integration of one or more essential amino-acids or more, possibly lacking in the diet.

Starting from these assumptions, it was possible to ascertain that the addition of protein hydrolysates to feed piglets:

a) improves the coefficients to apparent digestibility of energy, dry matter, organic matter, proteins and amino-acids;

b) significantly lowers, the pH of the content of the gut (caecum, colon and rectum) as well as the development of the micro-organisms contained in the digestive tract;

c) improves the productive performances of animals, particularly as far as weight gain and feed efficiency are concerned.

Among the possible action mechanisms, the most likely seem to be those related to "modulations" of the intestinal microflora development and to metabolic roles of peptides which, as such, can be absorbed even in remarkable amounts.

III - Lactic bacteria

In the last decade the results of considerable research have pointed out the possibility of improving health and performance of animals with the use of live micro-organisms such as *Lactobacillus* and *Streptococcus*. The terms "probiotics" attributed to these "bacterial preparations" is not really recent, since it was proposed by Parker in 1960. It is utilized to refer to substances that, in substitution for or as an integration of normal growth promoters, are capable of enhancing zootechnical productivity mainly by improving the health of the digestive tract which is sometimes compromised by the frequent intestinal dysmicrobisms occurring with intensive livestock production.

More precisely and concretely, lactic bacteria would act in a physiologic manner, regulating the balances of the intestinal micro-organisms with advantages for the useful flora, which is of mainly fermentative type, to the detriment of the noxious one, often putrefactive.

The administration of lactic bacteria to young animals actually allows one to reduce the incidence of diarrhoeas and to improve the productive performances of animals, as can be seen from the results of numerous studies.

The most suitable periods for the administration of lactic bacteria are:

a) after birth, because the digestive tract of the foetus must be considered axenic and only the contact with the vaginal mucosa of the mother during farrowing starts the bacterial colonization of the intestine;

b) during stress periods related to breeding techniques (weaning, changes in the diet, utilization of unsuitable feeds, etc.);

c) immediately after mass therapeutic treatments (antibiotic therapy in particular) which induce complete modifications of the intestinal microbiota.

Among these ways of using lactic bacteria, their administration immediately after birth can be very interesting since it allows, theoretically at least, precocious colonization of the digestive tract, thus orienting the development of bacterial flora in the way considered most favourable.

IV - New aspects of utilisation

All of these remarks show that both protein hydrolysates and lactic bacteria are also capable of improving the zootechnical productivity of animals through an adequate "modulation" of the development of the micro-organisms contained in the digestive tract. Therefore, the theoretical requirements exist that lead us to believe that amino-acids and peptides, administered together with lactic bacteria, accelerate the development and the activity of these micro-organisms, indirectly strengthening their efficacy.

The results of in-field trials carried out on piglets under weaning (**Table 1**) have shown the soundness of the hypothesis and the validity of the employment of lactic bacteria in connection with amino-acids and peptides.

Actually, the combined administration of the two "auxinics" reduces mortality following diarrhoeas, halves the incidence of disorders of the digestive tract, and improves animal growth significantly. Also amino-acids alone and above all lactic bacteria foster animal productivity, but their combination results in a synergy of action of undoubted scientific and practical interest.

In actual fact, therefore, the results of our research allow us to confirm the validity of the use of lactic bacteria in the prevention of pathology of the digestive tract in piglets.

At the same time, however, they lead us to believe that the combined administration of lactic bacteria, amino-acids and peptides definitely improves the probiotic effect which reveals itself in significant improvements in production and health of the animals.

Table 1: Probiotics and peptides associated: Effects on weight gain, diarrhoea and mortality rate from birth to weaning (1)

Groups Treatments (2)			A Control	B Peptides	C Probiotics	D Peptides + Probiotics	Significance
Piglets		no.	471	480	484	499	-
Average weight at birth		kg	1.22	1.21	1.21	1.22	n.s.
Daily weight gain		g.	186 D	195 C	207 B	221 A	**
Diarrhoea rate	(1st week	%	20.4 Aa	16.4 ABa	9.1 Bb	6.0 Bb	**
	(2nd week	%	28.8	28.8	21.4	14.7	n.s.
	(3rd week	%	11.7 ABb	23.5 Aa	7.8 Bb	5.8 Bbc	**
Mortality	(Total	%	11.7 a	12.7 a	11.5 a	8.4 b	*
	(Diarrhoea	%	6.7 ab	7.3 a	5.9 b	4.2 c	*
	(Other	%	5.0	5.4	5.6	5.2	n.s.

Source : Mordenti, A., Inf. Zoot., 32 (5), 69.

(1) Means of two trials carried out for a period of 34 days in autumn and winter.
Means not sharing a common superscript letter are significantly different: abc $p < .05$; ABCD $p < .01$.
(2) At birth (1st day of life) with: Control (.2g. dried whey); Peptides (.2g. whey + .2g. proteolysate); Probiotics (.2g. whey with 200 millions cells of *streptococcus faecium*). Peptides + Probiotics (.2g. whey + 2g. proteolytase + 200 millions cells of *strepotococcus faecium*). All substances were supported in 2ml water.