INFLUENCE OF VIRGINIAMYCIN ON THE APPARENT ILEAL AND FECAL NITROGEN AND AMINO ACID DIGESTIBILITIES IN PIGS FITTED WITH RE-ENTRANT CANNULAS.

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Introduction: Already for many years our laboratory is concerned with the phenomenon of growth promotion caused by addition of low levels of certain antibacterial substances to diets for growing pigs. Different mechanisms trying to explain this phenomenon have emerged in the literature (1,2,3): nutritional, metabolic, disease control effect. We focurred our attention mainly to the nutritional effects and obtained experimental evidence, using 50 ppm Virginiamycin as addition, of a substantial lesser microbial degradation of carbohydrates (4) and amino acids (5), combined with an enhanced resorption of the major nutrients (6) in the small intestine. Perfusion experiments (7) also revealed that Virginiamycin improves the resorption of amino acids in the terminal small intestine of the pig.

The present experiment was set up to study more deeply the influence of Virginiamycin on the apparent ileal and fecal nitrogen and amino acid digestibilities using pigs fitted with re-entrant cannulas at the end of the small intestine. This was done because in our opinion sparing of nutrients is only meaningfull if it occurs in the small intestine were nutrients are absorbed. Further ileal digestibilities must be much more revealing as fecal apparent digestibilities are greatly influenced by the metabolic activity of the microflora of the hind gut. This seems especially true for amino acids (8).

Material and methods: Two female pigs (Belgian landrace initial weight 20kg) were fitted with re-entrant cannulas in the terminal ileum according to the technique developed by Decuypere et al. (9). The pigs were housed on metabolism cages. The semi-purified diet consisted out of skim milkpowder (53%), corn starch (40%), corn oil (4%), cellulose (3%) supplemented with vitamines and minerals. For the treatment 50 ppm Virginiamycin was added to the diet. Polyethylene glycol (PEG, MW > 4000) ; was used as inert marker (0,5% in the diet). Control and Virginiamycin supplemented diets alternated weekly during 5 weeks. Equal amounts of feed (kg) were offered two times daily at 9h00 and 16h00 as a gruel (one part feed, two parts water). Water was supplied at libitum. Ileal digesta were collected weekly during 72h; sampling was automatic: a portion of about 10% of the total digesta flow was collected and immediately frozen for further analysis, the rest flowed back by grawity into the distal cannula of the pig. Digestibilities were determined by the indicator method using PEG concentrations in feed, ileal digesta and feces. The results were calculated by one way analysis of variance.

Results and discussion: The apparent ileal and fecal digestibilities of nitrogen and amino acids as influenced by Virginiamycin are summarized in table I and II respectively. As can be seen Virginiamycin improves the ileal digestibility of most amino acids (from-0,8 to + 4,8 percentage units) and protein (+ 2,1). The differences do not reach significance however, due to the great variation within the ileal data. Fecal digestibilities on the other hand were slightly lower during Virginiamycin treatment. Out of table I and II it is clear that important amounts of amino acids (especially glycine, serine, threonine and glutamic acid) disappear in the hind gut. We can assume that the greater the disappearance of amino acids in the hind gut, the lower the biological value of the digested protein will be, as nearly all recent literature data (10,11,12) indicate that amino acid resorption from the hind gut, while existing, has only marginal nutritional importance. The literature data further indicate that the nitrogen is absorbed from the hind gut mainly as ammonia and amines and is excreted nearly totally in the urine. The present experiment thus indicates that Virginiamycin can enhance the biological value of the digested protein by improving the digestibility of the protein and amino acids in the small intestine and confirmes previous research. However further fundamental research is needed to clarify the mechanism by wich the digestibility is improved and to check if the observed phenomenon also occurs with other growth promoting antibacterial substances.

Table I : Apparent ileal digestibilities of amino acids and total protein.

	Control	Virginiamycin
Lysine	87,7 ± 0,9°	89,1 ± 0,9
Histidine	97,5 ± 0,5	96,7 ± 0,4
Proline	87,2 ± 1,4	86,5 ± 1,0
Arginine	87,5 ± 1,6	88,8 ± 1,3
Glycine	55,7 ± 3,3	60,5 ± 2,2
Aspartic acid	78,7 ± 1,6	79,9 ± 1,4
Theonine	73,4 ± 1,9	75,4 ± 1,4
Serine	65,9 ± 2,3	67,8 ± 2,3
Glutamic acid	80,3 ± 1,4	81,4 ± 1,4
Alanine	74,1 ± 2,2	75,9 ± 1,3
Valine	80,2 ± 1,6	82,4 ± 1,0
Methionine	76,5 ± 1,6	79,8 ± 1,5
Isoleucine	79,4 ± 1,7	80,6 ± 1,3
Leucine	89,6 ± 0,8	90,1 ± 0,5
Tyrosine	96,9 ± 0,5	96,1 ± 0,5
Phenylalanine	89,7 ± 0,6	90,3 ± 0,7
Protein (Nx6,25)	78,1 ± 0,9	80,2 ± 1,0

°Mean ± S.E. (Means do not differ, P> 0,05).

Table II : Apparent fecal digestibilities of amino acids and total protein.

	Control	Virginiamycin
Lysine	93,6 ± 1,0°	92,3 ± 0,9
Histidine	98,1 ± 0,6	99,2 ± 0,3
Proline	96,1 ± 0,3	96,2 ± 0,2
Arginine	96,5 ± 0,9	95,5 ± 0,4
Glycine	82,4 ± 0,6	79,4 ± 0,6
Aspartic acid	90,6 ± 1,0	88,6 ± 0,5
Threonine	91,8 ± 0,7	90,3 ± 0,4
Serine	90,3 ± 0,4	88,5 ± 1,4
Glutamic acid	93,4 ± 0,6	92,6 ± 0,8
Alanine	83,1 ± 1,0	80,7 ± 0,8
Valine	92,4 ± 0,7	90,5 ± 0,5
Methionine	89,2 ± 0,5	88,1 ± 1,0
Isoleucine	91,7 ± 0,7	90,1 ± 1,0
Leucine	94,9 ± 0,5	93,3 ± 0,3
Tyrosine	96,6 ± 0,3	94,9 ± 0,3
Phenylalanine	94,0 ± 0,6	92,7 ± 0,2
Protein (Nx6,25)	90,3 ± 0,6	89,9 ± 0,4

°Mean ± S.E. (Means do not differ, P> 0,05)

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