CHAPTER 8

Intervention strategies: the use of probiotics and competitive exclusion microfloras against contamination with pathogens in pigs and poultry

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8.1 INTRODUCTION

Since Metchnikoff’s publication, The Prolongation of Life (Metchnikoff, 1908), at the beginning of this century there has been general agreement that the intestinal microflora has a strong effect on the health status of men and animals. In the 1970s and 1980s a great deal of effort was expended to improve the growth and health status of production animals by modulating the indigenous intestinal flora by live microbial adjuncts – probiotics. In these years several interesting publications appeared but consistent positive results in well-controlled double-blind studies were scarce. As a consequence, in the 1990s the interest in probiotics in animal nutrition has declined, especially in Europe. In contrast, research in human probiotics has received much attention and evidence is accumulating from well-designed, randomized
and placebo-controlled double-blind studies that a few well-characterized lactic acid bacteria possess documented health-promoting effects (Lee and Salminen, 1995; Salminen et al., 1996). The mechanisms behind the specific benefits include aspects such as immune modulation and strengthening the gut mucosal barrier due to:

- gut microflora modification;
- adherence to intestinal mucosa with capacity to prevent pathogen adherence;
- modification of dietary proteins by intestinal microflora;
- modification of bacterial enzyme capacity especially in relation to tumour formation;
- influence on gut mucosal permeability.

As a consequence, several probiotic supplements for humans have been introduced into the market.

Most of the above-mentioned mechanisms have been elucidated in diseased persons or persons with intestinal disorders. One can be sure that the expected effects are most prominent in such populations. So far no studies have been published in healthy volunteers where effects would be more difficult to demonstrate. Probiotics in human nutrition must, therefore, be considered as a way of maintaining a good health status and, possibly, in the long run, a way of preventing (chronic) diseases.

Several of the above-mentioned aspects are also of importance in improving the health status of production animals. Modern animal production practices do not promote a balanced intestinal microflora and metabolism. However, the interest of the feed industry in probiotics has decreased. Economic pressure on the meat industry and thus the lack of funds for fundamental and applied research and the observed variability in the results are probably the main reasons for this. But also in normal, healthy animals, an optimal balance of microorganisms in the intestinal tract may contribute to resistance to infectious diseases and help in efficient digestion, especially under stress situations such as in modern meat production, which generally do not support the development and maintenance of a well-balanced intestinal microflora. As a consequence colonization with potential pathogenic micro-organisms such as Salmonella, Campylobacter or virulent Escherichia coli serotypes (e.g. K88, K99, 0157, H7) can occur. This puts even more pressure on the meat industry. Subsequently, the increased use of antibiotics in animal production has caused severe problems in both veterinary and human medicine. Can probiotics break this vicious circle?

Several probiotics for use in animals have been introduced into the market, but many of them soon disappeared again. All of them claimed to improve the performance and health status of production animals through an effect on the gut epithelium or on the gut flora.