

# Efficient microorganisms with probiotic effect, an alternative in swine health

## Abstract

Use of microorganisms with probiotic capacity nowadays tends to be established in different systems of animal production throughout the world. The improvement in bioproductive behaviour when using probiotics in animal production depends not only on the production stage, but also on the selection of the strains used and the method of administration. Because the demand of international markets are products (meat, milk and eggs) healthy and that these do not directly or indirectly affect the health of man when consumed. In this review, we summarize some positive effects of microorganisms with probiotic capacity in the different categories of pigs at the production level. Bacteria and yeasts with probiotic effect in pigs are beneficial for health and productive indicators; the use of these bioproducts in the future could be promising for the benefit of human and animal health.

**Keywords:** animal health, lactic acid bacteria, yeasts

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## Introduction

The gastrointestinal tract system (GIT) hosts a large number of beneficial or harmful microorganisms (bacteria, yeasts, protozoa, among others) that fulfill various functions.<sup>1-3</sup> The beneficial microorganisms have the ability to: a) strengthen the natural microbiota,<sup>1,4</sup> b) inhibit the growth of pathogens,<sup>4</sup> c) improve the absorption of nutrients<sup>5</sup> and d) regenerate the atrophied microvilli.<sup>4,7</sup> Unfortunately, the ability of the natural microbiota to fight intestinal pathogenic infections is not always effective.<sup>1,7,9</sup> However, there are reports that the use of mixed cultures obtained from lactic acid bacteria (LAB) and probiotic yeasts help improve the health of the host.<sup>3,5,8</sup> Since the end of the last century, the use of chemotherapeutics in animal health was considered a threat by many scientists, because most of these drugs used belong to drugs in man.<sup>1</sup> Studies show that the use of probiotics in animals reduces the concentration of pathogens in animals, also decreases microbial resistance, because some bacteria can respond to other types of microbial species through plasmids R (fragment of genetic material) smaller than the chromosomes.<sup>3,9</sup> Where they replicate autonomously in the cytoplasm of the cell and can cause a problem to human health.<sup>11</sup> Therefore, some countries that are aware of these problems have increased the elimination of medicines as food additives, as is the case of antibiotics that promote growth, especially in the production of pigs and poultry, the main ones animal protein species.<sup>5,6,11</sup> This situation has promoted important efforts in the search for alternatives to antibiotics, which fulfill similar functions in the animal's health and do not directly or indirectly affect human health.<sup>1,3,6</sup> One of the alternatives with better results is the use of efficient microorganisms with probiotic capacity that can improve the resistance of animals to pathogenic bacteria and improve health.

## Discussion

The microorganisms with greater probiotic capacity used in monogastric animals (pigs, birds, rabbits, horses, among others) are yeasts (*Saccharomyces* spp., *S. boulardii*, *S. sabouraud*, *S. ovarum*, *Kluyveromyces* spp., *K. fragilis* spp. *K. fragilis* L-4 UCLV, *Candida utilis* among others) and the bacteria (*Lactobacillus* spp., *L. acidophilus*, *L. fermentum*, *L. rhamnosus*, *L. casei*, *L. bulgaricus*, *Enterococcus* spp., *Pediococcus* spp., *Bacillus* spp., *B. subtilis*, *B. licheniformis*, *Streptococcus* spp. *S. thermophilus* among others) the

great majority of these organisms exert the probiotic function in the different portions of the GIT that houses an abundant and very diverse microbial population.<sup>1,3,4,8</sup> Studies show that oral administration of microorganisms with probiotic capacity has shown beneficial effects for the health of pigs in different categories (Table 1), several small and large experiments in a high-performance commercial environment, the use of beneficial organisms in substitution of antibiotics (Neomycin, Oxytetracycline, Tylosin, among others) to treat some diarrheal disorders caused by different pathogens.<sup>9,11,12</sup> A growing interest in the use of microorganisms with probiotic capacity is to reduce the digestive disorders of pigs caused by *Escherichia coli* or *Salmonella* spp. It has been shown that certain strains of *L. acidophilus*, *L. bulgaricus*, *B. subtilis* decrease the number of *E. coli* in piglet faeces or *in vitro* in stool suspensions and also appear to reduce the development of enteric *Salmonella*.<sup>5,6,9</sup> The use of probiotics in swine production would represent a very practical strategy to reduce the proliferation of pathogens in the intestinal environment, therefore, the risk of infections in animal health.<sup>1,11,12</sup> It has been shown that the use of mixed cultures (bacteria and yeast) in swine production improves diarrheal disorders, they could also offer the possibility of increasing bioproductive parameters. Probiotics obtained from *Lactobacillus* spp., *Bifidobacterium* spp., *Enterococcus* spp., *Bacillus* spp. generally act in the small intestine and limit the risk of colonizing pathogens.<sup>6,8</sup> On the other hand, the use of live yeasts in animal feed acts from the moment of introduction.<sup>1,3</sup> It has also been seen that the use of probiotic biopreparations in pregnant sows has improved the health of neonatal pigs.<sup>2</sup> In addition, there are reports showing that the use of probiotics containing *S. boulardii* and *S. cerevisiae* in the diet of piglets after weaning improves nutrient uptake.<sup>3,7,10</sup> Other studies carried out with yeast and lactic acid bacteria increase the early restoration of thinning of the intestinal mucosa that usually occurs at weaning and possibly improve local resistance to pathogens in the intestine.<sup>3,5,9</sup> Probiotic regulate IgA levels at the intestinal level, a significant reduction of *E. coli* enterotoxinogenic has also been observed with the use of *S. boulardii* or *P. acidilactici* in piglets.<sup>5,6,8</sup> In addition, similar findings have been reported on the modulation of IgA development, together with a decrease in ileal prevalence, with the use of *L. sobrius*, *L. bulgaricus*, *S. thermophilus*.<sup>1,8,11,12</sup> In pigs for fattening, the productive performance, health and quality of the carcass have been improved.

**Table 1** Microorganisms with probiotic effects on the health of pigs in the different productive categories

Categories	Beneficial microorganisms	Effects	Reference
Newborn	<i>Lactobacillus spp.</i> , <i>L. acidophilus</i> , <i>S. thermophilus</i> , <i>B. subtilis</i> , <i>S. thermophilus</i> , <i>S. saccharomyces</i> . <i>K. fragilis</i> L-4 uclv	Diarrhea reduction * Death reduction ** Improves the immune system ***	1,4,7
Pre-weaning	<i>Lactobacillus spp.</i> , <i>L. acidophilus</i> , <i>S. thermophilus</i> , <i>B. subtilis</i> , <i>S. thermophilus</i> , <i>S. saccharomyces</i> . <i>K. fragilis</i> L-4 uclv	*, **, ***	2,5,8
Post-weaning	<i>Lactobacillus spp.</i> , <i>L. acidophilus</i> , <i>S. thermophilus</i> , <i>B. subtilis</i> , <i>S. thermophilus</i> , <i>S. saccharomyces</i> . <i>K. fragilis</i> L-4 uclv; <i>S. bouardii</i> , <i>P. acidilactici</i>	*, **, *** Regenerate atrophied microvils Regulación de IgA	1,3,4,5,10
Fattened pigs	<i>Lactobacillus spp.</i> , <i>L. acidophilus</i> , <i>S. thermophilus</i> , <i>B. subtilis</i> , <i>S. thermophilus</i> , <i>S. saccharomyces</i> . <i>K. fragilis</i> L-4 uclv	*, **, *** Regulates the hemato-chemical levels Improves the quality of the Chancel	1,4
Gestation	<i>Lactobacillus spp.</i> , <i>L. acidophilus</i> , <i>S. thermophilus</i> , <i>B. subtilis</i> , <i>S. thermophilus</i> , <i>S. saccharomyces</i> . <i>K. fragilis</i> L-4 uclv	Regulates the hemato-chemical levels Improves reproductive behavior	1,8,10,12

## Conclusion

The microorganisms with probiotic capacity in the different categories of pigs benefit positively and in the future would be promising for the benefit of the animal's health. Several investigations show that the use of probiotics can positively balance the natural microbiota, therefore, improve the state of animal health. However, a design and an adequate dose for the animals have not yet been established. It is important to select specific strains on a scientific basis and follow their behavior under strict control in vitro studies.

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## Conflicts of interest

Authors declare that there is no conflicts of interest.

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