

CLOSTAT®

CLOSTAT® contains PB6, a proprietary, patented strain of *Bacillus subtilis*. PB6 is a unique, safe and naturally-occurring probiotic that has been proven to kill a number of equine-specific pathogens — including a variety of *Clostridium* species.



MODE OF ACTION

The PB6 in CLOSTAT has been found to secrete one or more biocidal proteins that are inhibitory towards certain strains of pathogenic bacteria such as *Clostridium perfringens* and other equine-specific pathogens. These proteins disrupt the membrane of bacteria, causing leakage of the cell contents and ultimately killing the pathogenic bacteria without harming the beneficial gut microflora.

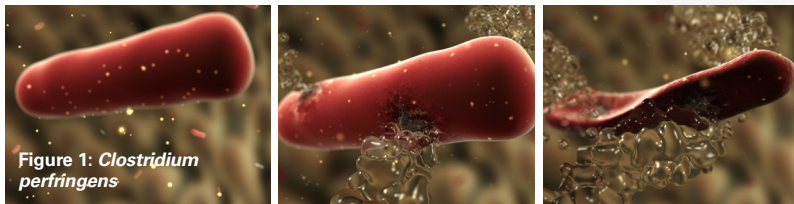


Figure 1: *Clostridium perfringens*

WHY IS THIS IMPORTANT?

Pathogenic bacteria like *C. perfringens* create lesions in the small intestine that compromise the integrity of the intestinal lining. Harmful pathogens and toxins can then pass through the intestinal lining into the bloodstream, resulting in intestinal inflammation and disease. By inhibiting the growth of pathogenic bacteria, the PB6 in CLOSTAT helps maintain a healthy microbial balance in the horse's digestive tract.

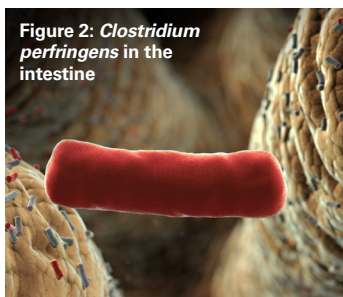


Figure 2: *Clostridium perfringens* in the intestine



Figure 3: Damaged gastrointestinal villi

CLOSTAT FEATURES

- Contains the probiotic PB6, a unique, patented strain of *Bacillus subtilis*¹
- Research-proven efficacy of PB6 against equine-specific pathogens
- Stable under normal pelleting conditions
- Demonstrated equine safety in foals and adults^{2,3}
- Stable during processing and packaging
- Stable when blended with other feed ingredients

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PB6 VS. EQUINE-SPECIFIC PATHOGENS

PB6 has been proven to inhibit the growth of several equine-specific bacterial pathogens, including *Clostridium difficile*, *Clostridium perfringens*, *Streptococcus equi* and *Rhodococcus equi*^{4,5} (confirmed equine pathogen isolates obtained from the Iowa State University Vet Diagnostic Lab). In the images below, the antagonistic activity appeared as clear zones between the PB6 (vertical streak) and the bacterial cultures (horizontal streaks).



Figure 4. Effect of PB6 against *Clostridium difficile*



Figure 5. Effect of PB6 against *Clostridium perfringens*



Figure 6. Effect of PB6 against *Streptococcus equi*

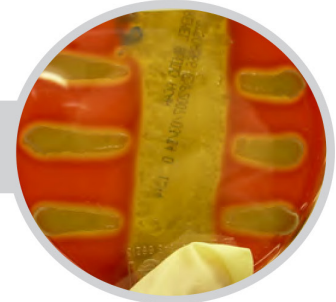


Figure 7. Effect of PB6 against *Rhodococcus equi*

EVALUATION OF ANTI-CROBIAL EFFICIENCY OF CLOSTAT AND ALTERNATIVE PROBIOTICS

Product Type	Products	Product Type					
		<i>Salmonella ser. Typharium</i>	<i>E. coli</i>	<i>R. equi</i>	<i>S. equi</i>	<i>C. perfringens</i>	<i>C. difficile</i>
Bacillus Products	CLOSTAT®	XX	X	XX	X	X	XX
	Product D			XX		X	X
Yeast Products	Product A			X			
	Product B						
Lactobacillus Products	Product C	XX	XX	XX	XX	X	X
	Product B	XX	XX	XX	XX	X	XX

Product Type	Products	Met CFU Label Claim	pH Stability	Thermostability
			pH 3	90°C
Bacillus Products	CLOSTAT®	Yes	XX	XX
	Product D	No	XX	XX
Yeast Products	Product A	Yes	XX	XX
	Product B	*	*	*
Lactobacillus Products	Product C	No	XX	
	Product B	No		

*Did not test due to poor performance in efficacy studies



1-800-752-2864
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References

1. US Patent 63 U.S. 7,247,199
2. Safety of *Bacillus subtilis* Strain PB6 In Neonatal Foals Following Oral, BB-08-00021.
3. Safety of Subactil in mature horses following oral administration, BB-08-00025.
4. Today, K., Bacterial Resistance to Antibiotics. Today's Online Textbook of Bacteriology. Accessed 5-6-16
5. Burke, M. L., & Moore, S. A. (2017). *Bacillus subtilis* Strain PB6 Demonstrates Growth Inhibition Toward Equine-Specific Bacterial Pathogens. Journal of Equine Veterinary Science, 58, 84-88. doi:10.1016/j.jevs.2017.08.016
6. Comparison of CLOSTAT and Competitor Products by Antimicrobial Activities, Thermal Stability and Gastrointestinal Tolerance, TD-14-00114.