

Avoid bacterial growth  
Control pathogens

# Novibac<sup>®</sup>

Antibacterials & Digestive Aid



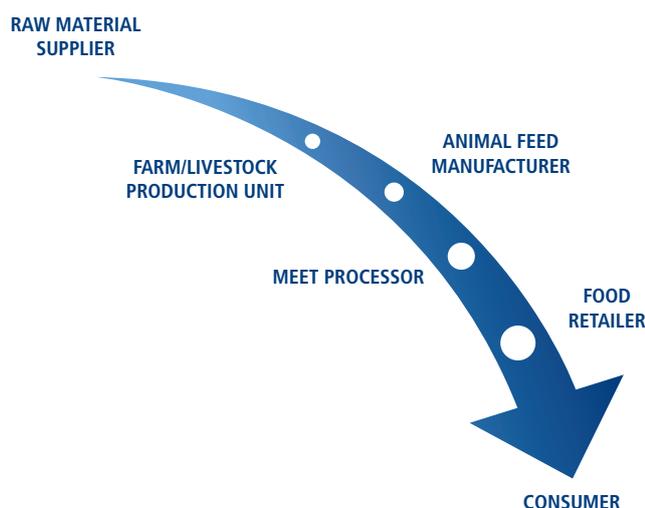


### Antibacterial complex for pathogens control

Feed quality is key to animal performance and contributes to the profitability. Both microbiological and chemical processes in raw materials and feed lower its nutritional value and contaminate it with hazardous molecules. Microbiological contaminants include moulds, yeasts and bacteria which lead to nutrient spoilage and production of toxic compounds. Chemical contaminants may already be present in raw materials and should be monitored closely (e.g. heavy metals, pesticides) or they may appear due to chemical reactions in the feed such as autoxidation.

### Bacteria in feed: a source of pathogens for the animal

Food scandals, the ban of antibiotics and public opinion for safe food, put special focus on prevention of bacterial contamination and maintenance of feed hygiene and quality standards. The whole production chain, from raw material producer to farmer plays a role in this 'farm to fork' process: safe feed is the first step to ensure safe food. Although feed hygiene is still the biggest determining factor on the prevalence of certain bacteria in meat, any risk of feed contamination with potentially pathogenic bacteria should be monitored and corrective actions should be taken. Apart from Salmonella and E. coli, other feed borne pathogens like Listeria and Campylobacter are of high concern due to their link with antibiotic resistance.



An integral feed hygiene program should include a clear risk identification program: a list of the risks, evaluation of their severity and the likelihood for occurrence, including optimal prevention/corrective measures and monitoring.

### Control points of a feed mill include:

- **The type of raw materials:** fish meals, animal and vegetable protein meals are at much higher risk for contamination compared to cereals. Moisture content, storage time and possible pretreatment by the supplier define the risk identification of the raw material.
- **A risk assessment of the installation** with special attention to elevators and dead corners, silos and bunkers, cooler, and other transport systems. Once the installation is contaminated, so is the feed passing through. Sufficient stock rotation and a 'first in, first out' - system should be implemented.
- **Production processes** including pelleting and heating can reduce the bacterial count in feed, but condensation of the warm air in the cooling phase can easily lead to quick and significant recontamination.
- **Pest control** (mice, birds, rats) and **personal hygiene**.





The Novibac® product range offers carefully designed preservative concepts that contribute to a better basic feed quality, assure longer shelf life and safeguard nutritional quality and palatability. Selection is based on active components, buffered or non-buffered mixes, liquid or dry application, corrosiveness, etc.

Based on know-how and experience, Innovad® can define with the customer the most appropriate product and application.



Fig. 1:  
Liquid applicator.

## Mode of action

Organic acids as antimicrobial agents function in two distinct ways:

- by lowering pH through the release of protons to the surrounding media which creates unfavourable conditions for pathogens, and
- by their ability to interchange between their undissociated and dissociated forms, depending on the pH of the surrounding environment. An acid in its undissociated form can diffuse freely through the cell membrane of microorganisms, into the neutral pH cell cytoplasm.

Once within the cell the acid undergoes a dissociation process by releasing protons that drop the internal pH. Bacteria must maintain a near neutral cytoplasmic pH to sustain functional macromolecules. As a consequence, the pH drop suppresses cell enzymes and nutrient transport systems, causes metabolic disturbances, cytoplasmic membrane leakage and death of the pathogen. Although bacteria are capable of exporting the excess protons, this requires consumption of cellular energy which eventually results in cell death.

Unlike antibiotics the antimicrobial activity of organic acids is pH dependent. At low pH, organic acids are mainly in their undissociated form. Consequently, the antimicrobial activity of organic acids is higher at low pH.

## Different types of acids and their properties

ACID/SALT	PHYSICAL FORM	SOLUBILITY IN WATER	CORROSIVENESS	ODOUR	TASTE	ANTI-BACTERIAL	ANTI-MOULD/ YEAST	PH REDUCER
ACETIC ACID	Liquid	+++	+++	Pungent, vinegar	Sour	+	++	++
FORMIC ACID	Liquid	+++	+++	Strong pungent, penetrating	Sour	+++	+	+++
PROPIONIC ACID	Liquid	+++	+++	Strong pungent, unpleasant	Fat	+	+++	++
BENZOIC ACID	Solid	-	+	Moderate, pungent	Sour	+++	++	++
FUMARIC ACID	Solid	-	0	Odourless	Fruit	0	0	++
LACTIC ACID	Liquid	+++	0	Moderate, pleasant	Sour milk	+++	+	++
CITRIC ACID	Solid	+++	0	Odourless	Pleasant sour	0	0	++
PHOSPHORIC ACID	Liquid	+++	+++	Odourless	Sour	0	0	+++
CA-FORMATE	Solid	++	0	Neutral	Sour	++	+	0
CA-PROPIONATE	Solid	++	0	Neutral	Sour	+	++	0

## Trials results

### Trial 1

**Raw material:** soybean meal

- Initial contamination: 400.000 CFU/g
- Moisture level: 3%

**Control vs Novibac®**

- Dose level **Novibac®** at 5 kg/T
- **Novibac®** was mixed in 500g sample
- Both samples were stored at 37°C
- Reduction of contamination was measured after 24h and 48h

TIME (H)	CONTROL (CFU/g)	NOVIBAC® (CFU/g)
0	400.000	400.000
24	360.000	3.200
48	315.000	1.200

### Trial 2

In vitro killing activity of **Novibac® CF60** against *C. perfringens*, *S. typhimurium* and *E. coli*, Belgium, 2017

Cultures were grown in media according to ISO/CD 10932/IDF 223 standard

- *Clostridium perfringens* (ID18110)
- *Salmonella typhimurium* (ID18106)
- *Escherichia coli* (both isolated from broilers and layers) (ID18107 and ID18108)

Optical density was measured at 580nm

- Growth without **Novibac® CF60** = 100%

**MIC was measured:** minimum inhibition concentration (ppm), concentration of active component resulting in <10% of initial contamination.

### Conclusions:

- At the recommended dose of 3000ppm, **Novibac® CF60** effectively inhibited growth of correspondent pathogens
- **Novibac® CF60** acts as a preservative for grains or feed and has the potential to beneficially alter the gut microflora by reducing the levels of pathogens. The mechanism is linked to the ability of acids to pass across the cell membrane of bacteria, dissociate in more alkaline interior and acidify the cell cytoplasm.

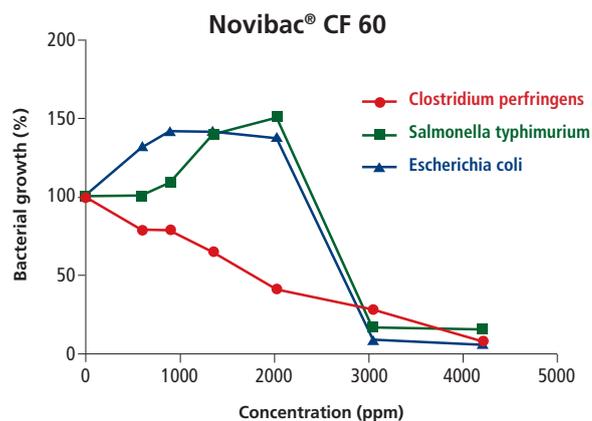


Fig. 2: Percentage of bacteria in relation to the minimum inhibitory concentration.



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