

CitriStim, a novel ingredient based on *Pichia guilliermondii* yeast

TECHNICAL



CLÉMENTINE OGUEY & Dr. MANFRED PEISKER* detail CitriStim, a novel ingredient based on *Pichia guilliermondii* yeast, beneficial in the diet for all life stages and classes of animals supporting immune function and production.

The European Food Safety Authority (EFSA) and the European Center for Disease Prevention and Control report a high resistance for commonly used antimicrobials in its summary report (2019). Despite the EU-wide ban of antibiotic growth promoters in animal feed, significant levels of these products are still used in the livestock industry and the search for alternatives remains high on the agenda.

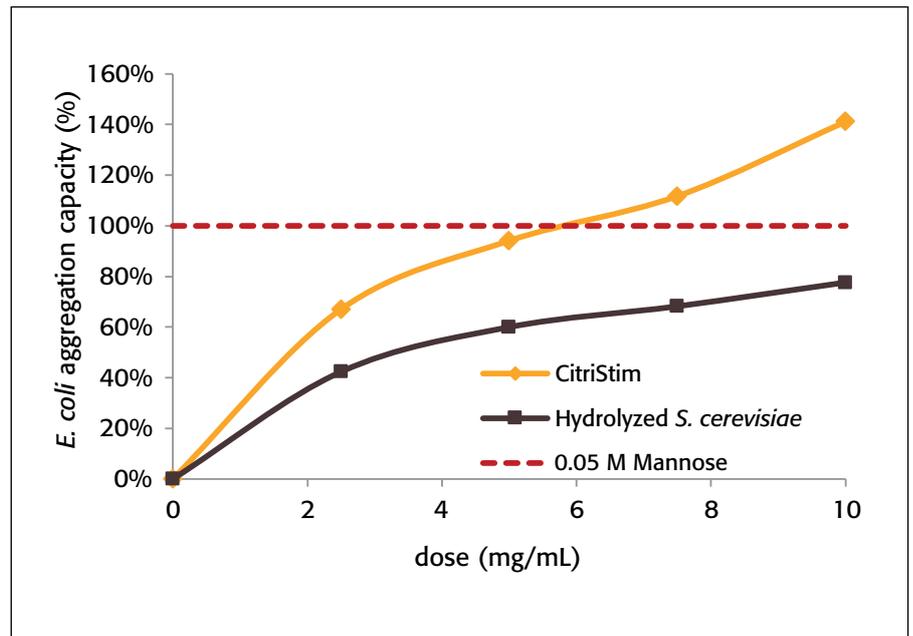
Yeast preparations are a primary ingredient in this context since, amongst others, they contain mannan-oligosaccharides (also known as MOS) and β -glucans. These components of the yeast cell wall exert specific functions in supporting the immune system and fend off pathogen invasion in the intestines of the host.

***Pichia guilliermondii*, a small cell size for optimal binding capacity**

Structure and characterization of the yeast cell as well as the cell wall are crucial to understanding their functionality. *Pichia guilliermondii* yeast cells are smaller compared to *Saccharomyces cerevisiae*.

As such they provide a greater surface area per unit of weight added to the feed. They are more hydrophobic, which promotes an even distribution in the gut and attracts lipophilic pathogens. ▷

Figure 1: Effect of digested yeast products on aggregation capacity of broiler strains of *E. coli* (mannose set as positive control).



◁ CitriStim showed its ability to bind potentially pathogenic bacteria. The yeast's passage through digestion further improved the effect of CitriStim (Figure 1).

The binding ability of the product was confirmed for broiler strains of *E. coli* and *Salmonella enterica*.

If potentially pathogenic bacteria are bound to CitriStim, then a lower proportion should adhere to the intestinal epithelium. Indeed, *in vitro* and *in vivo* trials confirmed the efficacy of CitriStim in reducing the adhesion of *E. coli* to the mucus lining the host's intestinal epithelium.

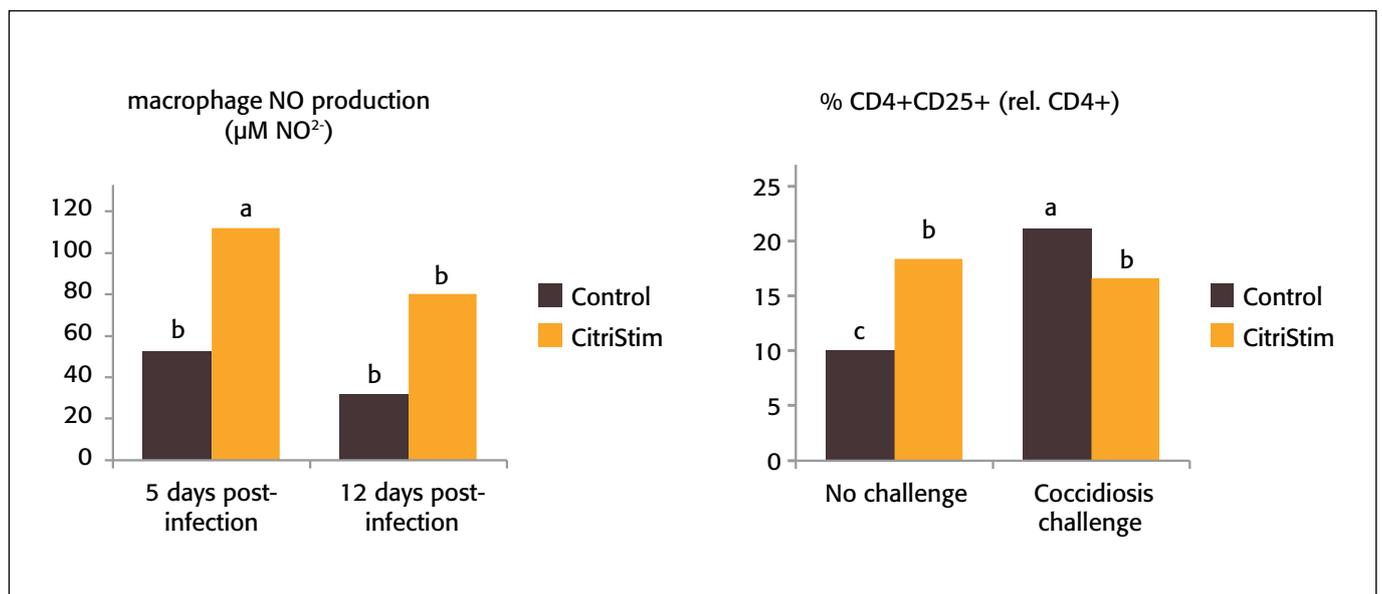
Besides the binding of potentially pathogenic bacteria, CitriStim has the ability to bind endotoxins such as lipopolysaccharide (LPS) from *E. coli*. This may limit systemic inflammation caused by luminal translocation of their endotoxins (LPS) into systemic circulation.

CitriStim - a potent immune modulator

Moreover, cell wall components of *P. guilliermondii*, present in CitriStim can modulate immune response. In broilers submitted by an infectious challenge (coccidiosis), it reinforced the activity of macrophages through an increase of nitric oxide (NO) production, and limited the increase of regulatory T- lymphocytes (see Figure 2). In parallel, cytokines'

production was also altered. One can namely cite a reduction of interleukin 10 and an increase of interleukin 1 shortly after challenge (Shanmugasundaram *et al.* 2013a et b). A similar immune response has been observed in turkey poults fed CitriStim and experimentally submitted to an inflammatory challenge (Shanmugasundaram *et al.* 2014). This suggests that the product has immune modulating properties

Figure 2: Impact of CitriStim on immune parameters in broilers subject to infectious challenge (coccidiosis).



adapted from Shanmugasundaram *et al.* 2013
a, b, c $p < 0.05$

that are independent of the type of challenge.

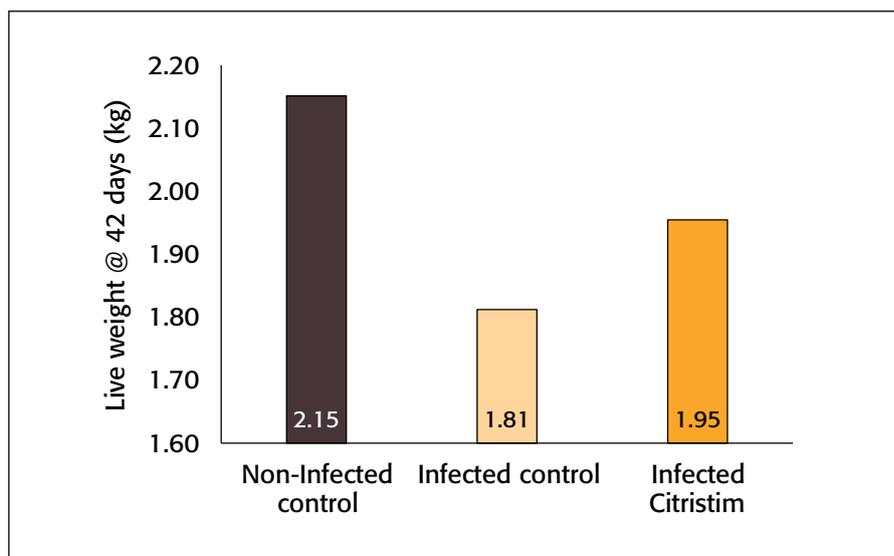
CitriStim could be regarded as an adaptogenic substance since it may stabilize physiological processes and promote homeostasis. The concept of adaptogens was already developed in 1947 to describe a substance that may increase resistance to biological stress, e.g. microbial challenge. CitriStim would fulfil the adaptogen criteria that it must be nontoxic, nonspecific, and believed to affect the physiology of the organism.

CitriStim favors the resilience of animals

Farm animals are constantly subject to stressful situations. In this context, CitriStim improves the resilience of animals, by promoting their resistance, enabling them to recover faster. CitriStim helps the animals to more easily face typical challenges occurring on farms. Animals receiving this proprietary whole inactivated yeast responded with improved productivity.

Amongst examples, feeding CitriStim limited the reduction in performance of broiler chickens

Figure 3: Performance of broiler chickens challenged with *Clostridium perfringens*.



challenged with *Clostridium perfringens* (Figure 3).

Conclusion

CitriStim is a unique, original and

innovative tool to secure productive performance of farm animals raised in commercial operations, strengthening production and providing proven benefits. **Ap**

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