



MACROGARD



MACROGARD, BETA-GLUCANS. The care they need in all stages of life.

The dog and cat food category is undergoing changes in which consumers choose their pet's food based on their own perceptions. Becoming increasingly aware of labels, looking for **natural and healthy** products, made with **safer and more nutritious** ingredients.

Beta Glucans

One of the best examples of these natural ingredients is **the purified yeast glucans**. They were certified as **GRAS** actives in a process submitted to FDA (Food and Drug Administration) from the United States (*Government Revenue Number* [GRN]: 000239) and **without long-term chronic toxicity** according to the scientific opinion on additive safety of **EFSA** (European Food Safety Authority) (Journal 2011; 9 (5): 2137). In nature, they can be found in an unavailable and poorly functional form in the innermost layers of the yeast cell wall.

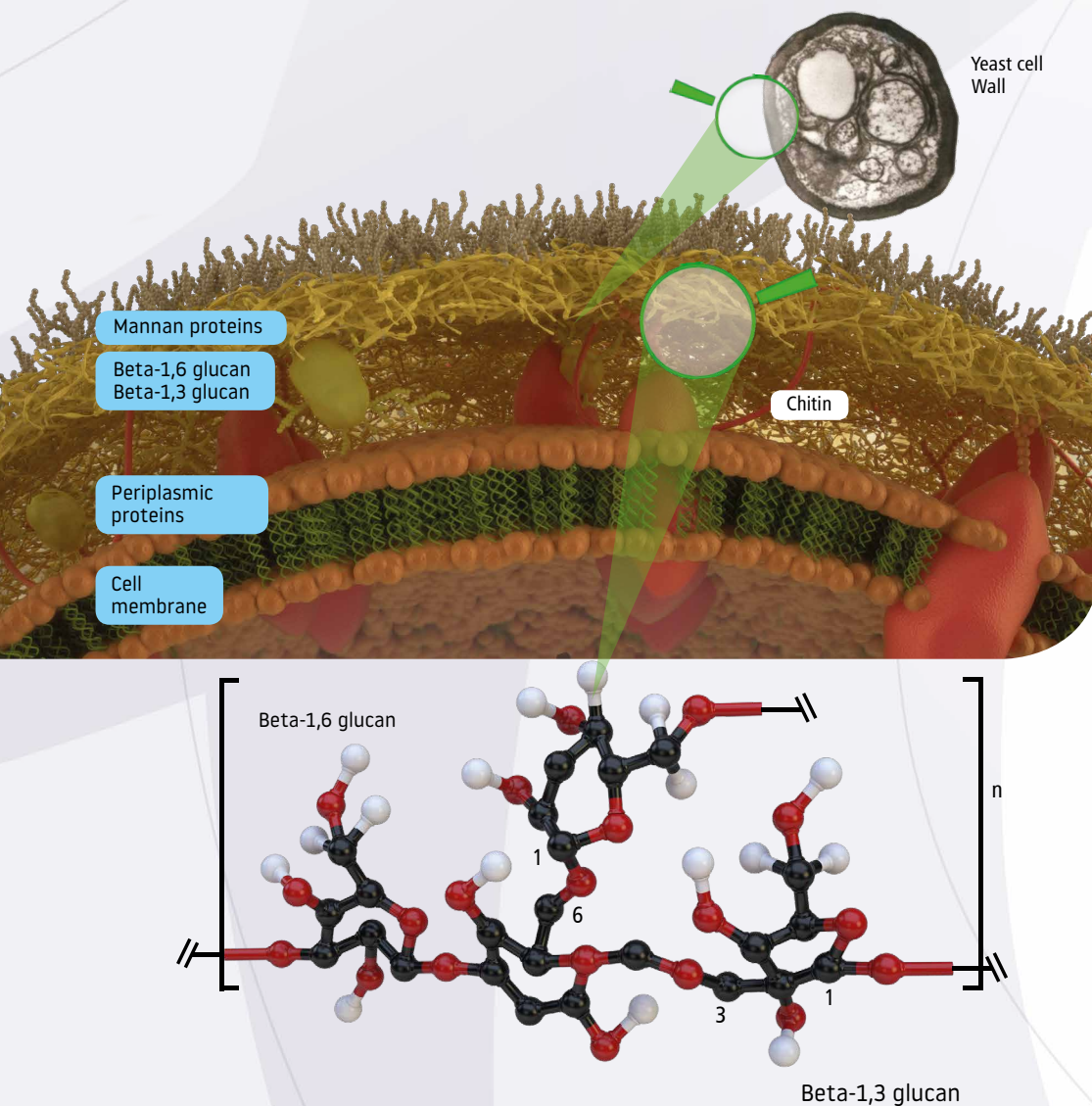
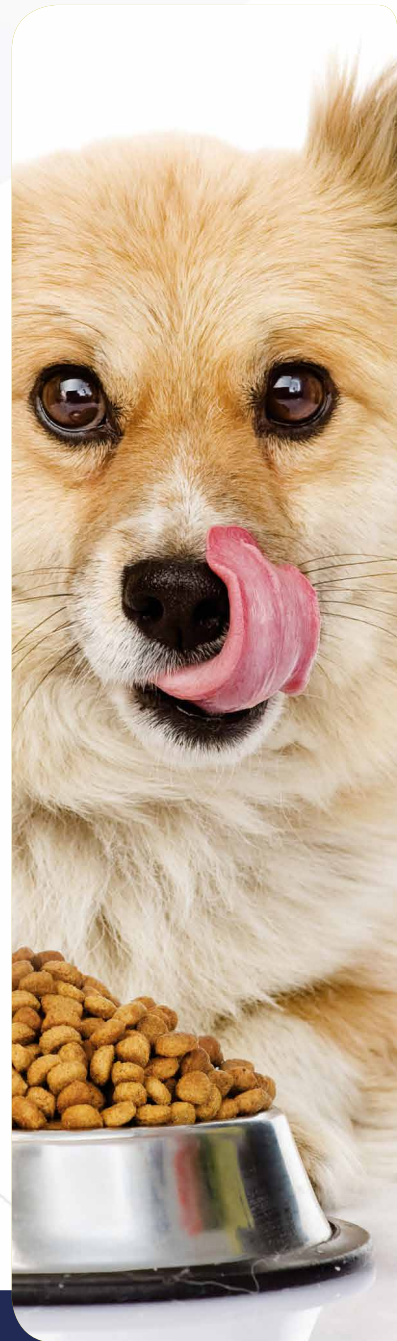


Figure 1: Illustration of yeast cell wall and representation (CPK) of beta-1,3/1,6-glucan chain

Purified beta-glucan activates pets natural defenses - Mode of Action

The digestive tract of animals cannot degrade the beta-glucan. Thus, after its ingestion, one portion has specific **prebiotic effect** for the intestinal microbiota, increasing the proportion of the genus *Akkermansia* (Cao et al., 2018) and another portion is captured in the small intestine by a cooperative process involving intestinal M cells and **macrophages**. The large beta-glucan particles are then internalized and fragmented into nanoparticles. During this process, they are transported to the bone marrow and to the reticuloendothelial system, where the small fragments are released.

These fragments are captured by other important players (cells) of the immune response. Finally, all cells involved in these processes are activated and the biological response will be appropriately modulated (Chan et al., 2009):



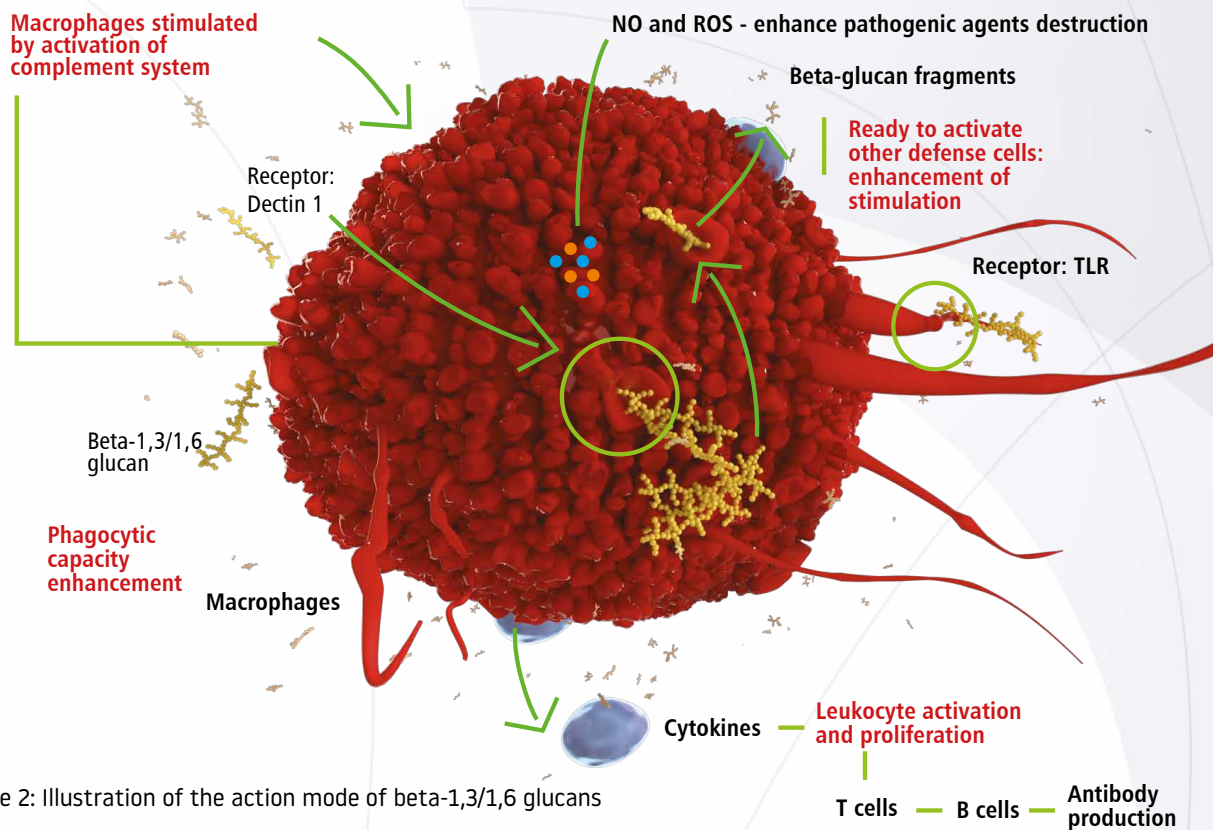


Figure 2: Illustration of the action mode of beta-1,3/1,6 glucans

Studies show that Beta-Glucans, based on their adjuvant effects, are ideal actives in important applications:



In raising natural defense cell levels after vaccination (Vojtek et al., 2017);



In the recovery of the defense system after the stress resulting from major challenges (Oliveira et al., 2019);



In the aid of blood glucose homeostasis (Vetvicka and Oliveira, 2014);



In the appetite control and lipid metabolism homeostasis (Vendramini et al., 2018).

Beta-Glucan and the maintenance of metabolic homeostasis

The humanization process of pets has decreased the exposure of these animals to natural microbial antigens and, consequently, leading to the loss of “proper training” of innate immune cells (macrophages and dendritic cells) that express pattern recognition receptors (PRRs) for the recognition of pathogen-associated molecular patterns (PAMPs) (Baker, 2006).

In recent years, several evidences indicate that obesity and type 2 diabetes are characterized by altered homeostasis. In adipose tissues, especially visceral tissues, this type of disorder contributes to the onset of obesity-associated metabolic changes and to the increased insulin resistance (Cao et al., 2018).

In this context, beta-glucan acts as an inactive “type of PAMPs”, that is, just an exercise for the natural defenses.

MacroGard: purified beta-glucan for health and well-being of pets

MACROGARD is a product rich in **purified beta 1,3/1,6 glucans**, extracted from a specially selected strain of *Saccharomyces cerevisiae* yeast.

Its production process involves a different technology that removes the layer of mannoprotein present in the outermost part of the yeast cell wall, allowing high exposure of the beta-glucan content and fully preserving the functionality in the molecule. Only this unique structure is capable of activating specific cells of natural defenses.

MacroGard keeps the biological response

1 Effects of MacroGard on blood glucose levels

Evaluation based on the standard protocol of the University of Louisville in dogs with induction of transient hyperglycemia for 12 days prior to testing, by treatment with 250 mg streptozotocin*/kg body weight.

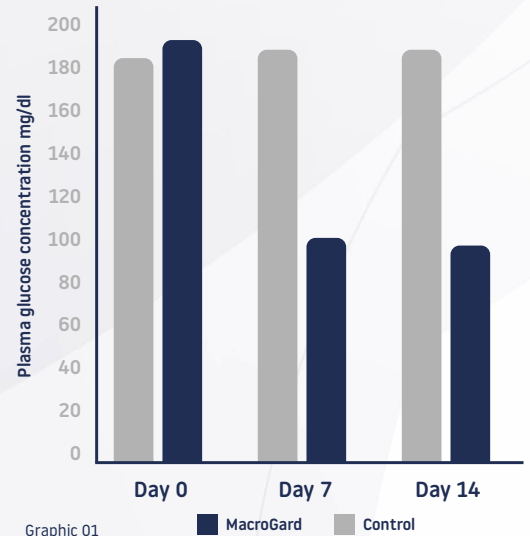
* Streptozotocin is an antibiotic used in induction of experimental transient hyperglycemia.

MACROGARD RECOVERED THE GLUCOSE HOMEOSTASE

The MacroGard supplementation (15 mg/kg body weight) significantly recovered ($P < 0.05$) the blood glucose homeostasis (within 7 days) of the animals from test group (9 dogs), compared to the animals from control group (9 dogs).

Graphic 01

100% reduction of plasma glucose concentration.



2 Effects of MacroGard on metabolic parameters and satiety-related hormone in obese dogs

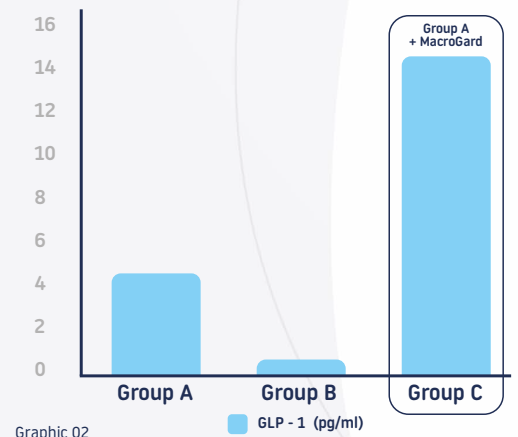
Evaluation based on the standard protocol of CEPEN (Nutrology Research Center) of the University of São Paulo, in 14 dogs, divided into two groups: Group A - obese dogs with body score 8 or 9/9; Group B - skinny dogs with body score 5/9, according to scoring system Laflamme D.P. (1997).

After two weeks of glucan-free diets for Groups A and B, Group A received a diet of 1000 ppm of MacroGard for a period of 90 days, and was then described as Group C. At the end of the test, it was evident that the appetite-suppressing hormone GLP-1 was significantly higher ($P < 0.05$) in Group C compared to the other groups:

MACROGARD HELPS THE APPETITE CONTROL

For Group C the appetite-suppressing hormone GLP-1 was significantly higher ($P < 0.05$) compared to the other groups.

Graphic 02

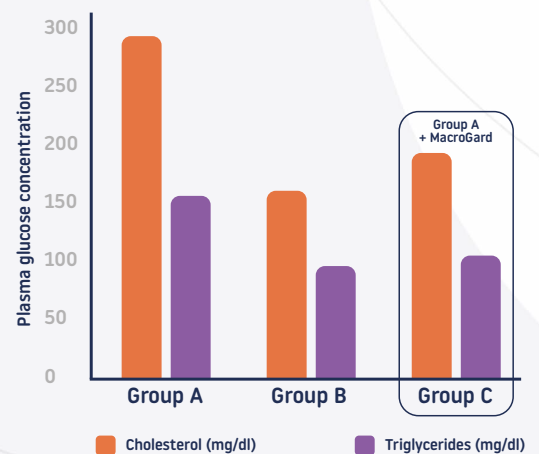


MACROGARD ACTS IN THE MAINTENANCE OF GLUCOSE AND FAT HOMEOSTASIS*

The obese dogs from Group C had significantly lower glycemia (basal and mean), cholesterol and triglycerides compared to the initial values of the obese dogs from Group A, and showed no statistical difference compared to the dogs from Group B.

*Unpublished data

Graphic 03



MACROGARD: THE WORLD'S MOST STUDIED BETA-GLUCAN!

INCLUSION LEVEL

- Pet
0.8 - 1 kg/ton (complete foods)
or 10 - 15 mg/kg live weight/day