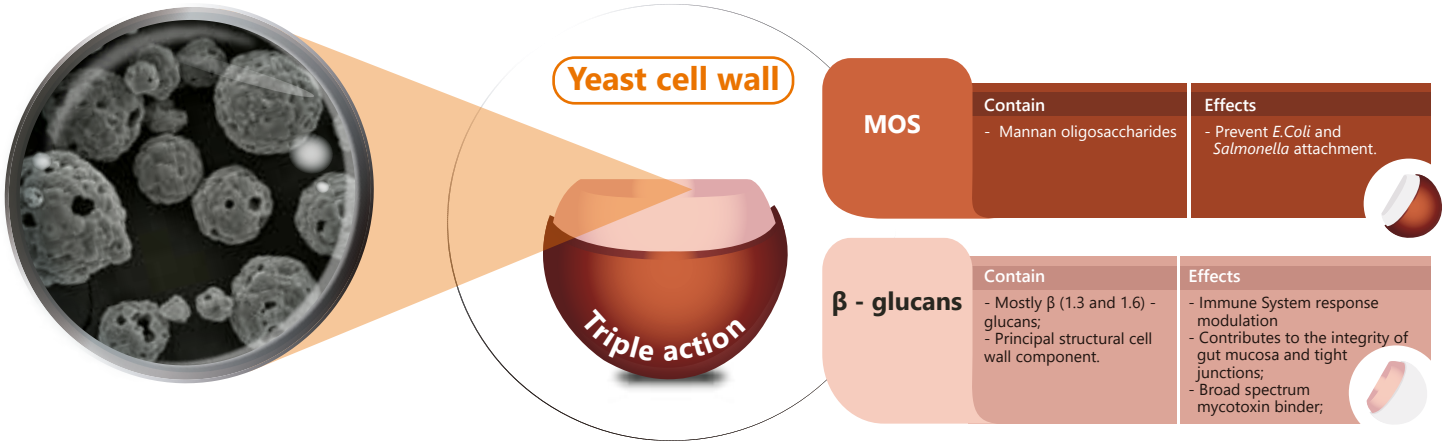
ImmunoWall®
HARD CORE YEAST CELL WALL

ImmunoWall® is a premium yeast fraction rich in β-glucans and mannan-oligosaccharides (MOS). ImmunoWall® prevents colonization of the intestinal tract by pathogens, stimulates the immune activity of the phagocytic cells, and enhances the action of beneficial bacteria such as lactobacillus and bifidobacterium, creating an immunological wall against diseases. It is a rich source of β-glucans, which have powerful mycotoxin adsorption properties.



Feed market leader

Unique fermentation result

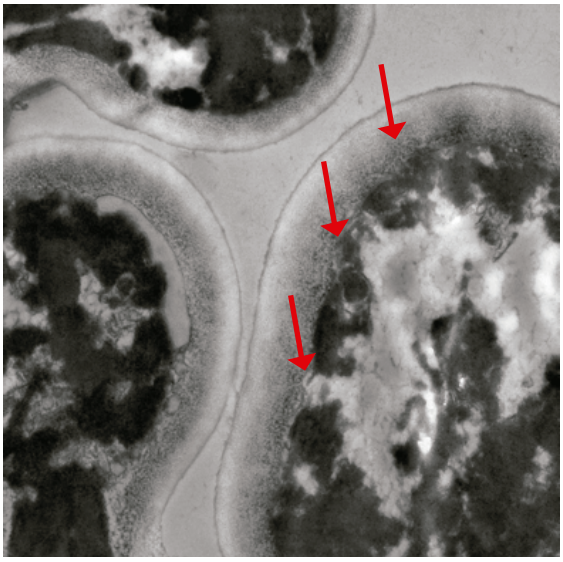
The yeast culture can be originated from the sugar cane, brewers or baker's/primary fermentation process. For many years the strain types were highlighted as the most important factor in processing. Today we know that, more important than the yeast strain is the fermentation environment that will indeed provide fundamental differences in the final product's composition. **There is a number of yeast products in the market. However, ImmunoWall® stands out for being produced in a challenging environment aiming ethanol production**. The yeast culture pass through numerous fermentation cycles, making the yeast cell wall much denser, resulting in higher carbohydrates rate and lower fat content on its composition, making it less digestible in the intestinal tract.

ImmunoWall® - Fermentation for Ethanol production	Baker's/ primary yeast fermentation
High T°: 35°C	Low T°: 4°C
Acid pH: 2.5 – 4.0	Neutral pH: 6.0 – 7.0
High alcohol content: 11%	***
Mature cells (yeast recycling)	Younger cells (single fermentation)
Indigestible cell wall (resistant in the intestinal tract)	Digestible cell wall
Yeast cell wall typical analysis	
Carbohydrates: 55%	Carbohydrates: 40%
MOS: 20%	MOS: 20%
β-glucans: 35%	β-glucans: 20%
Fat: 1 – 2%	Fat: 15 – 20%

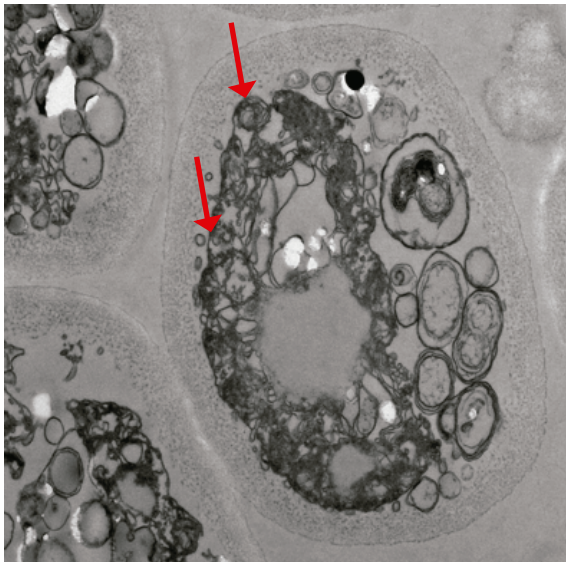
2/3 of β-glucans and 1/3 of MOS

The aggressive conditions during the sugar cane fermentation process to obtain ethanol leads the yeast to protect itself and, therefore, to strengthen its cell wall. Considering that β-glucans are like the yeast cell wall "skeleton", it is important to consider the ratio between β-glucans and MOS to measure it effectiveness. **The higher the β-glucans concentration, the lower the cell wall degradation** in the gastrointestinal tract. ImmunoWall® has a BG: MOS ratio close to 2: 1, while the primary yeast cell walls have a 1: 1 BG: MOS ratio.

ImmunoWall®



Yeast cell wall from primary fermentation



Source: Timo Meerloo / Electron Microscopy Facility Cellular & Molecular Medicine / University of California San Diego
** The arrows indicate the difference in the two cell walls β-glucan concentration. The darker part in the ImmunoWall® sample indicates a higher density in β-glucans.*

Carbohydrates results				
Product	**β-glucans (%)**	**α -D-glucan %**	**MOS (%)**	**BG:MOS ratio**
ImmunoWall®	**37.2**	**1.87**	**18.9**	**1.97**
A-MAX	15.9	0.62	15.95	**1.00**
CELMANAX SCP	14.6	1.17	12.26	**1.19**
Diamond V XP	4.55	19.28	0.11	*
Diamond V XPC	2.07	22.46	0.06	*
SAFMANNAN	25.9	8.12	25.6	**1.01**
ACTIGEN	20.6	2.7	20.0	**1.03**
BIOMOS	23.6	2.7	22.2	**1.07**
CW Angel	27.3	5.3	23.0	**1.19**

The comparative analysis of several yeast sources shows that ImmunoWall® has the highest β-glucans rate and the best BG:MOS ratio.

Source: ICC Brazil
α-D-glucan - present largely in the cereal plant cell wall and it's a starch source so we observe a high amount in products that are yeast cultures.
** The ratio (BG:MOS) can not be accurately calculated because the MOS content is very low.*

	Dry matter (%)	Gross energy (Kcal/kg)	TMEn (Kcal/kg DM)	Digestibility (%)
ImmunoWall®1	93.6	4216	2390	53.1
ImmunoWall®2	95.7	4337	2962	65.1
Baker's yest[1]	96.5	4396	3910	85.8
Baker's yeast[2]	96.4	4508	3490	74.6
Brewer's yeast[2]	94.1	4227	3311	73.7

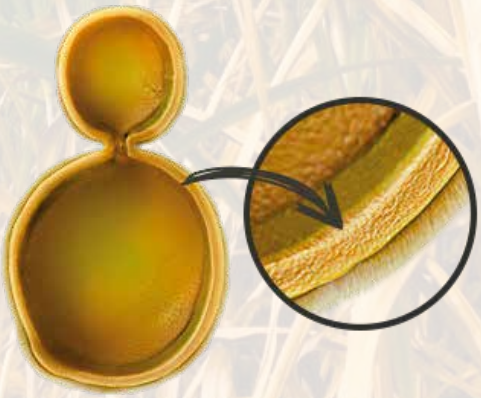
[1]*University of Illinois, August 2010.* [2]*University of Illinois, September 2014.* **Performed on cecetomized roosters.*

While all yeast cell wall samples have similar gross energy, ImmunoWall® has the lowest true metabolizable energy, meaning the lowest digestibility compared with brewers and baker's yeast samples.

ICC researches highlights that ImmunoWall® has:

ImmunoWall® has the highest β-glucan concentration making it less degradable in the intestinal tract.

- **54 trials** in several specieis showing efficacy.
- **+200 in vitro trials.**
- **Walmart** antibiotic free diets approved.
- Effective **against mycotoxins.**
- Efficacy at **low dosages.**



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