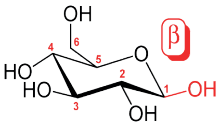
BETAPOLO®

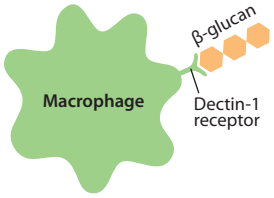
Drinking,
Enhancing,
Boosting

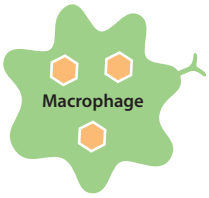
What is Glucans?

- A polysaccharide, long chain of carbohydrate, generally found in bacterial & yeast cell wall, mushrooms and grains.
- Mainly existing as two types: α-glucan and β-glucan
- α-glucan: dextran, glycogen, starch
- β-glucan: cellulose
  → act as an immunopotentiator, deeply related with non-specific immune activation

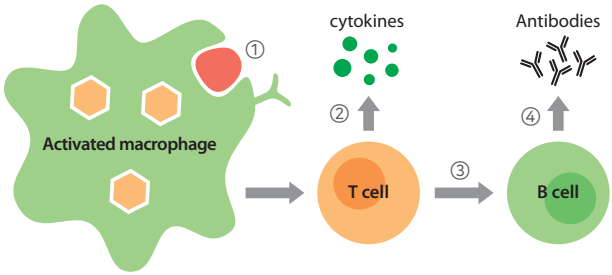


Mode of action : β-glucan





1. **β-glucans are captured by the macrophages or dendritic cells via the Dectin-1 receptor.**
2. **The large β-glucans are then internalized and fragmented into smaller particles**



3. **Then, following actions are generated by those small fragments of β-glucans**

① β-glucan activates macrophage itself and accelerates phagocytosis of macrophage

②,③ β-glucan activates macrophages to secrete many types of immune messengers(cytokines) which stimulate T-cells to increase potency of cellular immunity and those T-cells secrete more cytokines to activate B-cells as well.

④ Activated B-cells produce huge level of antibodies to fight against various pathogens(called humoral immunity).

Introduction of Betapolo

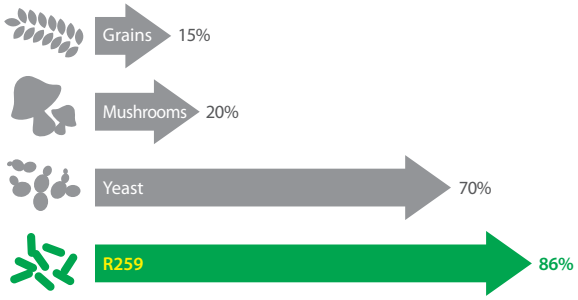
1. **Unique 'β-(1,3)-glucan' oral solution**
   - Extracted from *Agrobacterium* sp.
2. ***Agrobacterium* sp.**
   - Naturally found in various grains and plants
   - Key microorganism for production of different enzymes and glucans

<A picture of *Agrobacterium* sp. R259>

3. ***Agrobacterium* sp. R259**
   - Patented strain of *Agrobacterium* which producing β-glucan of Betapolo
   - Producing huge level(up to 86%) of pure and soluble β-(1,3)-glucans

Advantages of Betapolo's β-glucan

1. **Pure & soluble β-glucan**
   - Among the different β-glucan producing sources, *Agrobacterium* sp. R259 is one of a microorganism which produces purest β-glucans.



<Purity of β-glucans from different sources(%)>

   - Most of β-(1,3)-glucans from different sources are insoluble, which indicates that these cannot be fully dissolved in GI tract as well.

   "... a major obstacle to the clinical application of β-(1→3)-glucan is its low solubility in aqueous media.(J.N.LEE et al. 2001)"

   In a contrast, β-(1,3)-glucan of Betapolo is specially prepared as an oral solution form, so free from the solubility issue.

2. **Efficient β-glucan**
   - With its high purity & solubility, β-glucan of Betapolo can perfectly act with even very small doses

β-glucan sources	Effective dose/day
Mushroom(*L.edodes*)	2,700mg
Yeast(*S.cerevisiae*)	1,430mg
Agrobacterium sp. R259	412mg

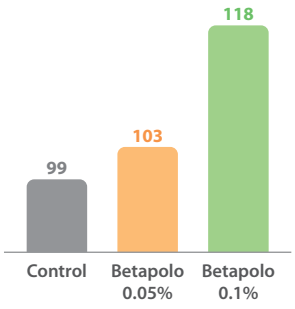
<Comparison of effective dose of β-glucan from different sources for human consumption>

3. **Proven, human-grade β-glucan**
   - Registered and qualified in various organizations as a β-glucan for both human & animals consumption
   - Widely applied not only for Betapolo, but also for human foods, drinks & supplements as well

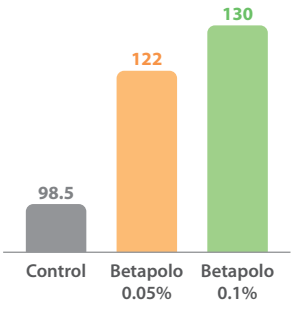
Ministry of Food and Drug Safety
Korean Intellectual Property Office
GMP
USDA

Features & trials of Betapolo

1. Immunopotentiator : Increases & activates immune cells



Proliferation of PBMC(%)* after application, chicken 0~5wks



Proliferation of Splenocyte(%) after application, chicken 0~5wks**

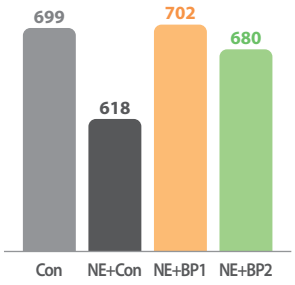
*PBMC(Peripheral Blood Mononuclear Cell) : Consist of various immune cells such as lymphocytes and monocytes.
A good indicator of activation of immune system.

**Splenocyte : Consist of various immune cells such as lymphocytes, dendritic cells and macrophages which situated in the spleen.

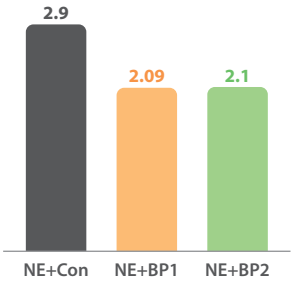
2. Protection against diseases : Helps to overcome various diseases & promotes growth

Necrotic Enteritis(NE) + Coccidiosis challenge, United States Department of Agriculture
- Ross broilers, 24 days trial

Trial groups	Application
Con	No challenge or Betapolo
NE+Con	*C.perfringens*(10^9cfu), *E.maxima*(10^4) challenged without Betapolo
NE+BP1	Challenged with 0.05%(0.5ml/L of water) of Betapolo
NE+BP2	Challenged with 0.1%(1ml/L of water) of Betapolo

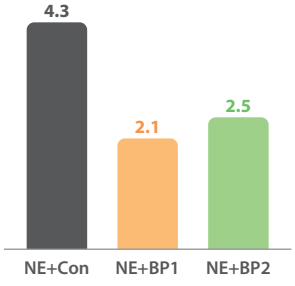


Final body weight(g/bird)

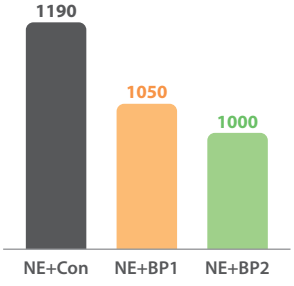


Lesion score*

*1=mild, 2=moderate, 3=severe



Fecal *Eimeria* oocysts level(10^7/bird)



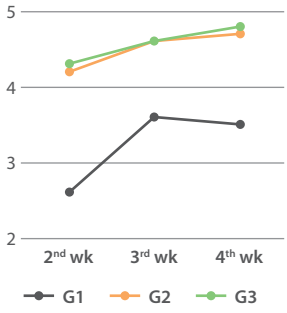
NetB toxin* level(ng/ml)

*NetB toxin
- *C.perfringens* producing endo-toxin
- Major cause of Necrotic Enteritis

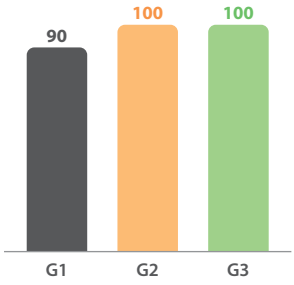
3. Vaccine booster : Increases efficacy of various vaccines & helps them to protect herds perfectly

ND(Newcastle Disease) vaccine boosting effect of Betapolo
- Specific-Pathogen-Free chicken, 4 weeks trial
- Vaccination: ND vaccine with a dose of $10^{6.6}$EID50/bird, spray inoculated at day 1.

Trial groups	Application
Con	No vaccine or Betapolo
G1	Vaccinated without Betapolo
G2	Vaccinated with 0.05%(0.5ml/L of water) of Betapolo
G3	Vaccinated with 0.1%(1ml/L of water) of Betapolo



NDV antibody titer, measured by HI test(log2)



NDV antibody positive rate in 2nd wk(%)

BETAPOLO®

Description	Natural β-(1,3)-glucan oral solution for livestock
Active Ingredients	β-(1,3)-glucan, more than 3%
Application	Stimulates and enhances immunity, growth promotion. Boosts efficacy of various vaccines
Dosage	Add 0.5-1ml of Betapolo to 1 liter of drinking water
Package & appearance	1 liter plastic bottle Dark brown liquid oral solution
Storage & shelf life	Keep packing tightly closed Store in dry and cool places, avoid direct sunlight 24 months from manufacturing date

Manufactured by Naturence Co., Ltd.

Marketed by Turms International Inc.

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