

## Comparison of immunological effects of commercially available $\beta$ -glucans: part III

### Abstract

$\beta$ -Glucans represent the most studied natural immunomodulators. With the well-described structure and function, the use of glucans slowly but steadily progresses from supplements to drug. However, direct comparisons of biological activities of individual glucans are rare. As this study will show, no direct connection between source and immunological activities was found. Based on these results, we can conclude that highly purified and highly active glucans have strong and pleiotropic effects, whereas poorly defined glucans have only medium (if any) biological effects.

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### Conclusion

The third part of our ongoing investigation of commercially available glucans clearly demonstrated that several differences among samples exist, which might be an explanation for sometimes confusing results found in the literature. Similarly to our previous two comparisons,<sup>7,12</sup> we tested 15 different glucans differing in source (mushroom, yeast, barley and oat). Again, **Glucan #300** served as a **benchmark**. Our study confirmed that where there is no basal level (IL-2 or IFN- $\gamma$ ), all or at least most glucans showed significant activity. However, in other biological activities, most of the glucans showed very limited if any activity, which was most clear in case of cancer growth. Clearly, individual glucans differ in biological effects based on tested characteristics. No clear relevance between the source used for isolation and biological effects has been found. From all samples, **the Glucan #300 was the most active sample.**

<b>Glucan</b>	<b>Source</b>	<b>Manufacturer</b>
Beta Glucan	Oat	Bioimersion, Bellevue, WA, USA
Organic Immuno-build Mushrooms	Mushroom	Rainbow Light Nutritional Systems Santa Cruz CA, USA
Reishi Mushroom Extract	Mushroom	Mehdi Reishi
Beta Glucan	Yeast	Cape Fear Naturals, Wilmington, NC, USA
Beta 1,3 Glucans	Yeast	The Vitamin Shoppe, North Bergen, NJ, USA
Beta 1,3/1,6-D-Glucan	Yeast	Piping Rock, Ronkonkoma, NY, USA
$\beta$ -Glucan Ball	Mushroom	Umeken, Cerritos, CA, USA
Beta Glucan	Yeast	Vistra, Thailand
Barley Beta Glucan	Barley	Doctor's Best, Irvine, CA, USA
Beta Glukan	Mushroom	Nef De Sante, Prague, Czech Republic
Yestimun	Yeast	Leiber, Bramsche, Germany
Sangraksu Chaga Mushroom	Mushroom	Betaglucan Korea, Seoul, Korea
Beta 1,3 Glucan	Mushroom	Douglas Laboratories, Pittsburg, PA, USA
Beta Glucan	Yeast	Source Naturals, Santa Cruz, CA, USA
#300	Yeast	Transfer Point, Columbia, SC, USA

Dose (mg/ml)	25	50	100	200	400	800
Beta Glucan	288±2.7	30.0±2.7	31.6± 3.1	31.6±2.6	33.8±3.9	34.8±2.1
Organic Immuno-build Mushrooms	30.4±2.2	30.9±3.8	31.6±3.4	34.7±4.0	36.5±3.5	37.1±2.7*
Reishi Mushroom Extract	30.5±2.6	33.4±4.1	35.6±2.8	37.8±2.9	40.1±2.8*	40.5±3.8*
Beta Glucan	28.9±2.5	30.0±2.4	32.7±3.1	34.1±4.1	33.8±3.8	35.2±4.1
Beta 1,3 Glucans	30.1±2.7	32.1±1.9	33.0±2.8	33.8±2.2	35.4±2.9	35.1±3.3
Beta 1,3/1,6-D-Glucan	34.0±2.5	36.8±2.9	37.9 ±2.8*	40.1±3.4*	41.1±3.5*	42.0±3.7*
β-Glucan Ball	28.8±2.1	33.1±2.5	30.8 ±1.7	32.4±2.2	33.9±2.1	36.5±2.8
Beta Glucan	29.9±3.2	33.1±3.1	34.5 ±1.9	33.2±3.1	34.1±3.0	38.1±4.1*
Barley Beta Glucan	30.1±2.8	31.3±2.8	32.1±4.1	32.9±1.9	35.1±4.1	33.5±2.5
Beta Glucan	30.8 ± 2.2	32.8±2.7	32.1±1.9	36.3±2.3	34.9±2.1	39.6±3.1*
Yestimun	33.8 ± 1.8	44.5±2.7*	46.6±3.2*	47.9±3.1*	48.8±2.0*	49.9±3.3*
Sangraksu Chaga Mushroom	30.4 ± 3.4	33.8±2.2	43.8±1.1*	44.5±2.7*	45.8±2.1*	43.5±4.5*
Beta 1,3 Glucan	31.1 ±2.2	32.9±1.9	35.2±3.8	36.3±2.7	38.1±2.9*	37.6±2.5*
Beta Glucan	29.5±1.8	33.1±1.9	37.8±3.0*	40.1±2.5*	42.2±2.9*	44.4±4.1*
#300	42.3±2.1*	47.8±2.0*	54.8±3.2*	56.5±3.2*	54.8±3.1*	61.7±3.5*

Beta Glucan	1.01±0.34*
Organic Immuno-build Mushrooms	0.76±0.33*
Reishi Mushroom Extract	1.67±0.23*
Beta Glucan	1.11±0.42*
Beta 1,3 Glucans	1.02±0.26*
Beta 1,3/1,6-D-Glucan	2.64±0.11*
β-Glucan Ball	0.78±0.35*
Beta Glucan	0.12±0.38
Barley Beta Glucan	0.34±0.22
Beta Glukan	1.06±0.24*
Yestimun	3.89±0.45*
Sangraksu Chaga Mushroom	1.01±0.26*
Beta 1,3 Glucan	0.45±0.11*
Beta Glucan	2.78±0.33*
#300	6.34±1.65*
PBS	0.08±0.02

Beta Glucan	27.9 $\pm$ 3.3*
Organic Immuno-build Mushrooms	16.6 $\pm$ 2.2*
Reishi Mushroom Extract	33.0 $\pm$ 2.6*
Beta Glucan	4.9 $\pm$ 0.8*
Beta 1,3 Glucans	15.1 $\pm$ 1.1*
Beta 1,3/1,6-D-Glucan	37.6 $\pm$ 2.5*
$\beta$ -Glucan Ball	13.2 $\pm$ 5.5*
Beta Glucan	34.8 $\pm$ 7.1*
Barley Beta Glucan	27.5 $\pm$ 4.4*
Beta Glukan	18.2 $\pm$ 2.1*
Yestimun	111.4 $\pm$ 7.9*
Sangraksu Chaga Mushroom	16.2 $\pm$ 2.3*
Beta 1,3 Glucan	15.5 $\pm$ 3.3*
Beta Glucan	66.2 $\pm$ 5.1*
#300	198.2 $\pm$ 8.9*
PBS	2.2 $\pm$ 0.1

**Table 5** Effects of glucan on secretion of IL-2

Beta Glucan	226.5± 38.6
Organic Immuno-build Mushrooms	76.8±21.1
Reishi Mushroom Extract	311.8±56.5
Beta Glucan	216.7±34.3
Beta 1,3 Glucans	111.1±25.7
Beta 1,3/1,6-D-Glucan	272.9 ± 66.5
β-Glucan Ball	43.4±11.2
Beta Glucan	39.6±21.0
Barley Beta Glucan	101.3±52.1
Beta Glukan	277.5±66.9
Yestimun	543.8±87.1
Sangraksu Chaga Mushroom	116.0±32.7
Beta 1,3 Glucan	90.1±23.5
Beta Glucan	55.2±11.9
#300	828.7±101.5
PBS	0
Con A	1 067.3±299.2

Beta Glucan	22.1±1.9
Organic Immuno-build Mushrooms	21.2±2.6
Reishi Mushroom Extract	18.2±3.6
Beta Glucan	19.5±2.7
Beta 1,3 Glucans	20.8±3.8
Beta 1,3/1,6-D-Glucan	16.9±3.4*
β-Glucan Ball	20.7±3.2
Beta Glucan	24.5±2.6
Barley Beta Glucan	23.6±2.5
Beta Glukan	21.1±2.9
Yestimun	15.3±1.7*
Sangraksu Chaga Mushroom	20.5±2.2
Beta 1,3 Glucan	22.1±1.9
Beta Glucan	16.3±3.5*
#300	11.7±1.2*
PBS	24.6±2.1