

Glucans and Cancer: Comparison of Commercially Available β -glucans – Part IV

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Abstract. *Background/Aim:* β -Glucans are well-established immunomodulators with strong effects across all immune reactions. Due to the extensive amount of studies, glucans are steadily progressing from a non-specific immunomodulator to a licensed drug. However, direct comparisons of higher numbers of different glucans are rare. *Materials and Methods:* In this study, we used 16 different glucans isolated from yeasts, mushroom, algae, and oat and compared their effects on phagocytosis, IL-2 production, antibody secretion, and inhibition of three experimental cancer models. *Results:* Our results showed significant differences among tested glucans, showing that despite the fact that glucans in general have strong stimulating effects on most aspects of the immune system, it is necessary to choose the right glucan. *Conclusion:* Based on our studies, we can conclude that highly purified and active glucans have significant pleiotropic effects.

In summary, this study is a follow-up of our three previous studies, testing 43 different glucans. From these experiments, we can conclude that on one hand, glucans can have substantial effects on all branches of the immune system, but on the other hand, not all glucans are created equal. Similar to our older comparative studies, we used glucans isolated from yeast, mushroom, algae, and oat. However, no clear correlation between function and other characteristics, such as source or solubility, could be reached. The differences between activities of our commercially available glucans might be an explanation for the sometimes confusing results found in the literature. In all tests employed in our study, Glucan #300 was the most active.

Table 1. List of glucans used in this study.

	Glucan	Source	Solubility	Manufacture
1	Beta Glucan 500 mg	Yeast	Insoluble	Priority One Vitamins
2	Beta Glucan (1,3/1,6) -Hypoallergenic	Yeast	Insoluble	Kirkman
3	Supreme Beta Glucan 95% 500 mg	Yeast	Insoluble	Hippo Herbs
4	Beta 1,3 Glucan #710	Yeast	Insoluble	Dee Cee Lab
5	ImmunotiX 500	Yeast	Insoluble	Xymogen
6	Beta Glucan,	Yeast	Insoluble	Wonder Laboratories
7	ImmunoMed 3-6	Yeast	Insoluble	NuMedica
8	Super Pure Beta 1,3 Glucan Algae Extract	Algae	Insoluble	The Synergy Company
9	Beta 1,3 Glucans	Yeast	Semi-Soluble	Puritan's Pride
10	Immune Support with β Glucan	Yeast, Mushrooms	Insoluble	Lindberg
11	Glucan Elite	Yeast	Semi-Soluble	Pro Formulations MD
12	Beta Glucan	Yeast	Semi-Soluble	Professional Formulas
13	Avena Sativa (Oat) Powder	Oat	Semi-Soluble	Maple Lifesciences
14	Beta Glucan 1,3-1,6	Yeast	Soluble	Bulk Supplements.com
15	Beta 1,3 Glucan	Yeast	Insoluble	AFI (America's Finest)
16	Glucan #300	Yeast	Insoluble	Transfer Point

Table II. *Effect of glucan dose on phagocytosis.*

Glucan	50 µg	100 µg	200 µg	400 µg
1	33.6±1.9	37.4±2.2*	38.9±2.4*	40.1±3.3*
2	31.8±1.7	35.8±3.0	37.2±2.1*	38.2±4.3*
3	33.8±2.7	38.9±3.1*	40.2±4.3*	42.2±2.7*
4	31.1±3.3	32.8±2.6	35.3±3.8	38.9±3.1*
5	35.6±1.9	38.9±2.2*	41.9±2.8*	43.9±3.2*
6	32.9±2.8	34.9±2.6	38.1±2.3*	40.1±3.5*
7	33.1±1.9	35.2±3.8	36.8±4.1	37.8±1.3*
8	38.9±1.8*	42.8±3.2*	44.9±2.1*	48.2±3.2*
9	37.6±2.7*	42.8±2.9*	47.8±3.1*	45.9±2.6*
10	36.1±2.2*	37.4±2.8*	40.4±3.1*	44.4±3.2*
11	33.1±3.8	34.9±3.1	36.1±1.8*	37.7±2.2*
12	37.1±4.2	39.1±2.8*	40.7±3.0*	40.1±3.5*
13	28.7±2.1	30.5±3.0	31.7±2.1	30.4±3.0
14	34.6±1.9	38.1±2.2*	38.2±2.4*	39.3±2.6*
15	31.6±2.9	33.8±2.8	35.0±3.2	38.2±1.9*
16	47.5±3.1*	52.5±3.5*	55.8±3.8*	55.0±4.0*

Table III. *Effect of glucan supplementation on IL-2 production.*

Glucan	IL-2 (pg/ml)
1	234.7±28.7
2	211.9±73.3
3	464.4±39.9
4	255.2±44.7
5	465.8±87.1
6	414.8±49.7
7	331.7±87.9
8	637.3±99.9
9	612.2±56.6
10	674.3±106.6
11	398.3±48.5
12	435.7±56.5
13	270.5±44.6
14	399.8±40.3
15	295.2±38.7
16	801.1±102.7
PBS	0
Con A	1 011±301.2

Table IV. *Effect of glucan supplementation on antibody formation*

Glucan	% of control (ovalbumin only)
1	118.3±27.2
2	101.1±28.8*
3	252.2±20.1*
4	217.2±36.5*
5	241.1±31.7*
6	272.0±28.9
7	102.6±40.3*
8	293.0±38.5*
9	245.5±25.8*
10	272.3±29.2
11	142.3±34.4*
12	199.3±41.3
13	128.2±29.8*
14	177.4±30.5
15	155.7±43.8*
16	337.2±37.4
Ovalbumin + FA	486.4±44.8

Table V. *Effect of glucan supplementation on suppression of lung cancer.*

Glucan	No. of metastases in lung
1	23.6±3.6
2	24.2±3.1
3	16.5±2.0*
4	22.6±2.9
5	18.1±1.5*
6	20.6±2.9
7	22.1±2.0
8	14.2±1.8*
9	17.2±3.5*
10	15.5±1.7*
11	21.6±2.2
12	16.6±1.7*
13	23.0±3.1
14	20.2±3.1
15	20.8±3.9
16	11.3±1.4*
PBS	25.3±2.0

Table VI. *Effect of glucan supplementation on mammary carcinoma.*

Glucan	Tumor weight (mg)
1	564.8±77.8
2	601.3±69.9
3	373.5±58.9*
4	525.7±73.2
5	552.1±90.8
6	501.3±42.9*
7	559.4±83.9
8	401.9±53.4*
9	512.7±98.3
10	389.0±51.7*
11	553.7±73.1
12	447.1±44.3*
13	590.2±66.0
14	501.7±40.8*
15	520.2±77.1
16	302.4±57.2*
PBS	681.4±66.8

Table VII. Effect of glucan supplementation on weight of some organs and primary tumors in melanoma-treated mice.

Glucan	Liver	Lung	Spleen	Tumor
1	1.66±0.20	0.21±0.09	0.32±0.07	0.51±0.11
2	1.64±0.23	0.20±0.07	0.31±0.08	0.49±0.12
3	1.34±0.04*	0.19±0.05	0.36±0.11	0.44±0.14
4	1.60±0.25	0.22±0.06	0.35±0.12	0.48±0.24
5	1.64±0.27	0.17±0.10	0.34±0.19	0.42±0.19
6	1.31±0.08*	0.18±0.09	0.28±0.05*	0.37±0.07*
7	1.62±0.22	0.22±0.09	0.35±0.08	0.47±0.17
8	1.30±0.11*	0.23±0.05	0.32±0.12	0.30±0.11*
9	1.78±0.14	0.25±0.09	0.33±0.11	0.29±0.08*
10	1.67±0.17	0.27±0.09	0.30±0.16	0.55±0.11
11	1.59±0.14	0.22±0.07	0.32±0.08	0.52±0.12
12	1.19±0.10*	0.21±0.08	0.22±0.10	0.46±0.11
14	1.39±0.14*	0.24±0.06	0.35±0.12	0.35±0.15*
15	1.77±0.23	0.25±0.04	0.36±0.11	0.52±0.14
16	1.22±0.05*	0.18±0.02	0.21±0.5*	0.33±0.08*
PBS	1.85±0.10	0.22±0.03	0.37±0.06	0.60±0.13