Technical Bulletin

Lectin from *Phaseolus vulgaris* (red kidney bean)

Leucoagglutinin PHA-L, lyophilized powder

L2769

Product Description

Lectins are proteins or glycoproteins of non-immune origin that agglutinate cells and/or precipitate complex carbohydrates. Lectins can bind glycoproteins even in the presence of various detergents.[1] The agglutination activity of these highly specific carbohydrate-binding molecules is usually inhibited by a simple monosaccharide. However, for some lectins, di-, tri-, and even polysaccharides are required.

Lectins are isolated from a wide variety of natural sources, including seeds, plant roots and bark, fungi, bacteria, seaweed and sponges, mollusks, fish eggs, body fluids of invertebrates and lower vertebrates, and from mammalian cell membranes. The precise physiological role of lectins in nature is still unknown. However, lectins have proven very valuable in a wide variety of applications *in vitro*, including:

- blood grouping and erythrocyte polyagglutination studies
- mitogenic stimulation of lymphocytes
- lymphocyte subpopulation studies
- fractionation of cells and other particles
- histochemical studies of normal and pathological conditions

A range of lectins suitable for the above applications is available. Most of our lectins are highly purified by affinity chromatography. However, some are offered as purified or partially purified lectins, suitable for specific applications. Many of the lectins are available conjugated to the following moieties, where conjugation does not alter the specificity of the lectin:

- fluorochromes (for detection by fluorimetry)
- enzymes (for enzyme-linked assays)
- insoluble matrices (for use as affinity media)

Please refer to Table 1 for general information on the most common lectins.

Tri- and tetra-antennary glycopeptides containing outer galactose residues and an α-linked mannose residue substituted at positions C-2 and C-6 are specifically bound by PHA-L.[2] PHA-L also reacts with Tamm-Horsfall glycoprotein, fetuin, and porcine thyroglobulin (weakly). Agglutination activity is inhibited by galactosyl-(1,4)-N-acetylglucosaminyl-α(1,2)-mannose. However, PHA-L does not react with all glycoproteins that contain this sugar.

Lectins from *Phaseolus vulgaris*, have not been proven to be specific for any particular oligosaccharide.[3,4] Instead, PHA-L recognizes terminal galactose residues of complex glycans on mammalian glycoproteins such as thyroglobulin.

Five *Phaseolus vulgaris* isolectins with similar amino acid compositions can be separated: L4, L3E1, L2E2, L1E3, and E4.[5]

Several theses[6-10] and dissertations[11-16] cite use of product L2769 in their research protocols.

Precautions and Disclaimer

For R&D use only. Not for drug, household, or other uses. Please consult the Safety Data Sheet for information regarding hazards and safe handling practices.

Storage/Stability

Aggregation is thought to occur in the presence of high concentrations of 2-mercaptoethanol.

Preparation Instructions

This lectin is soluble in phosphate buffered saline, pH 7.2 (1 mg/mL).

References

1. Rueben, L., *et al*., *Biochemistry*, **16(9)**, 1787-1794 (1977).
2. Cummings, R.D., and Kornfeld, S., *J. Biol. Chem*., **257(19)**, 11230-11234 (1982).
3. Chrispeels, M.J., and Raikhel, N.V., *Plant Cell*, **3(1)**, 1-9 (1991).
4. Schumacher, U. *et al*., "Lectins as tools in histochemical techniques: a review of methodological aspects", in *Lectin Reviews* (New York), Vol. 1, pp. 195-201 (1991).
5. Leavitt, R.D. *et al*., *J. Biol. Chem*., **252(9)**, 2961-2966 (1977).
6. Sprayberry, Kristen M., "History of stress affects cell-mediated immunity". The Pennsylvania State University, B.S. honors thesis, p. 7 (2018).
7. Thompson, Ameeka Louise, "Characterization of Interferon Regulatory Factor Mucosal and peripheral blood responses to vaccination with the licensed live oral typhoid vaccine Ty21a". University of Liverpool, M.Phil. thesis, p. 35 (2011).
8. Côrte-Real, Beatriz Fernandes, "Effect of amino acid substitutions in alpha-gliadin peptides on their immunogenicity in coeliac disease". Universidade de Lisboa, M.Sc. thesis, p. 20 (2015).
9. Harris, Angela, "Characterization of Interferon Regulatory Factor-7 in Defined Subsets of Human Peripheral Blood Mononuclear Cells and Analysis of the Effect of Knockdown on HIV-1 Infection". University of Manitoba, M.Sc. thesis, p. 47 (2017).
10. Rowley, Allison Annette, "Potential Downstream Immunological Effects of Evolved Disease Tolerance in House Finches". Virginia Polytechnic Institute and State University, M.S. thesis, p. 13 (2020).
11. Alizadeth, Hossein, "An Investigation into Bioactive Proteins and Their Changes During Imbibition, Germination and Development of Red Kidney Bean Seeds (*Phaseolus vulgaris* L.)". University of Canterbury, Ph.D. dissertation, pp. 89, 115 (2011).
12. Jabeen, Almas, "Study of the Suppression of Inflammatory Arthritis at Molecular Level by Natural and Synthetic Inhibitors of TNF-α and IL-1β". University of Karachi, Ph.D. dissertation, pp. 42, 59 (2013).
13. Ehmke, Manja, "NLRC5: An NLR member with impact on adaptive and innate immune mechanisms and its protective role in the progression of colitis". Christian-Albrechts-Universität zu Kiel, Dr. rer. nat. dissertation, p. 28 (2015).
14. Rump, Katharina, "Einfluss genetischer Varianten im Aquaporin 5-Promotor-Gen auf Schlüsselmechanismen der Sepsis" ("Influence of genetic variants in the aquaporin 5 promoter gene on key mechanisms of sepsis"). Universität Duisberg-Essen, Dr. rer. nat. dissertation, p. 32 (2015).
15. Wong, Raymond Waiman, "Targeting Viral RNA Processing to Control HIV-1 Infection". University of Toronto, Ph.D. dissertation, p. 191 (2018).
16. Al-Abedi, Raheem Abd Zaid Abed, "Metastatic cell responses to anticancer therapy: The possible role of cancer stem cells". Oxford Brookes University, Ph.D. dissertation, p. 65 (2018).

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Table 1. General lectins guide

Lectin	MW (kDa)	Subunits	Specificity		Mitogenic Activity
			Blood Group	Sugar	
Abrus precatorius					+
• Agglutinin	134	4		Gal	
• Abrin A (toxin)	60	2		Gal	
• Abrin B (toxin)	63.8	2(αβ)		Gal	
Agarius bisporus	58.5	-	-	β-gal(1→3)galNAc	+
Anguilla anguilla	40	2	H	α-L-Fuc	
Arachis hypogaea	120	4	T	β-gal(1→3)galNAc	
Artocarpus integrifolia	42	4	T	α-gal→OMe	+
Bandeiraea simplicifolia					
• BS-I	114	4	A, B	α-gal, α-galNAc	
• BS-I-A_4	114	4	A	α-galNAc	
• BS-I-B_4	114	4	B	α-gal	
• BS-II	113	4	acq, B, Tk, T	glcNAc	
Bauhinia purpurea	195	4		β-Gal(1→4)GalNAc	+
Caragana arborescens	60; 120[a]	2/4	-	GalNAc	
Cicer arietinum	44	2	-	Fetuin	
Codium fragile	60	4	-	GalNAc	
Concanavalin A	102	4	-	α-Man, α-Glc	+
Succinyl-Concanavalin A	51	2	-	α-Man, α-Glc	+[b]
Cytisus scoparius	-	-	-	GalNAc, Gal	
Datura stramonium	86	2(αβ)	-	$(GlcNAc)_2$	
Dolichos biflorus	140	4	A_1	α-GalNAc	
Erythrina corallodendron	60	2	-	β-Gal(1→4)GlcNAc	+
Erythrina cristagalli	56.8	2(αβ)	-	β-Gal(1→4)GlcNAc	
Euonymus europaeus	166	4(αβ)	B,H	α-Gal(1→3)Gal	+
Galanthus nivalis	52	4	(h)	Non-reduced α-Man	
Glycine max	110	4	-	GalNAc	+[c]
Helix aspersa	79	-	A	GalNAc	
Helix pomatia	79	6	A	GalNAc	
Lathyrus odoratus	40-43	4(αβ)	-	α-Man	+
Lens culinaris	49	2	-	α-Man	+
Limulus polyphemus	400	18	-	NeuNAc	
• Bacterial agglutinin	-	-	-	GalNAc, GlcNAc	
Lycopersicon esculentum	71	-	-	$(GlcNAc)_3$	
Maackia amurensis	130	2(αβ)	O	Sialic acid	+
Maclura pomifera	40-43	2(αβ)		α-Gal, α-GalNAc	
Momordica charantia	115-129	4(αβ)	-	Gal, GalNAc	
Naja mocambique mocambique	-	-	-	-	
Naja naja kaouthia	-	-	-	-	

Narcissus pseudonarcissus	26	2	(h)	α-D-Man	
Persea americana	-	-	-	-	
Phaseolus coccineus	112	4	-	-	
Phaseolus limensis	247 (II)	8	A	GalNAc	+
	124 (III)	4			
Phaseolus vulgaris					
PHA-E	128	4	-	Oligosaccharide	+
PHA-L	128	4	-	Oligosaccharide	+
PHA-P					
PHA-M					
Phytolacca americana	32	-	-	$(GlcNAc)_3$	+
Pisum sativum	49	4(αβ)	-	α-Man	+
Pseudomonas aeruginosa PA-I	13 – 13.7	-	-	Gal	+[c]
Psophocarpus tetragonolobus	35	1	-	GalNAc, Gal	
Ptilota plumosa	65; 170	-	B	α-Gal	
Ricinus communis					
• Toxin, RCA60	60	2	-	GalNAc, β-Gal	
• Toxin, RCA120	120	4	-	β-Gal	
Sambucus nigra	140	4(αβ)	-	αNeuNAC(2→6)Gal, GalNAc	+[c]
Solanum tuberosum	50, 100[a]	1,2	-	$(GlcNAc)_3$	
Sophora japonica	133	4	A,B	β-GalNAc	
Tetragonolobus purpureas	120 [A]	4	H	α-L-Fuc	
	58 [BA]	2	H	α-L-Fuc	
	117 [C]	4	H	α-L-Fuc	
Triticum vulgaris	36	2	-	$(GlcNAc)_2$, NeuNAc	+
Ulex europaeus					
UEA I	68	-	H	α-L-Fuc	
UEA II	68	-			
Vicia faba	50	4(αβ)	-	Man,Glc	+
Vicia sativa	40	4(αβ)	-	Glc,Man	+
Vicia villosa	139	4	$A_{1+}T_n$	GalNAc	
• A4	134	4	A_1	GalNAc	
• B4	143	4	T_n	GalNAc	
Vigna radiata	160	4	-	α-Gal	
Viscum album	115	4(αβ)	-	β-Gal	
Wisteria floribunda	68	2	-	GalNAc	

[a] Concentration-dependent molecular weight

[b] Non-agglutinating and mitogenic

[c] Mitogenic for neuraminidase-treated lymphocyte

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