Technical Bulletin

Lectin from *Phaseolus vulgaris* (red kidney bean)

Phytohemagglutinin PHA-P, lyophilized powder

L8754

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.[2] 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[3]

A range of lectins suitable for the above applications is available. Most Sigma-Aldrich® 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.

Lectin PHA-P is not inhibited easily by monosaccharides, but may be inhibited by oligosaccharides. PHA-P is a mixture of PHA-E (MW = 128 kDa) and PHA-L (MW = 126 kDa).

Several publications,[4,5] theses[6,7] and dissertations[8-11] cite use of product L8754 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 6.8, at 1 mg/mL.

Procedure

A general agglutination procedure using this lectin with 96-well plates is as follows:

1. Prepare a lectin solution of 1 mg/mL in PBS buffer, pH 6.8.
2. Pipette 50 µL of fresh PBS into each well and add 50 µL of the lectin solution into the first well.
3. Serial dilutions are made by pipetting 50 µL from each successive well into the next well.
4. Blood type A with a 2% hematocrit is used as the substrate.
5. Pipette 50 µL of blood into each well.
6. Visually determine agglutination.

References

1. Lotan, R. *et al*., *Biochemistry*, **16(9)**, 1787-1794 (1977).
2. Chrispeels, M.J., and Raikhel, N.V., *Plant Cell*, **3(1)**, 1-9 (1991).
3. 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).
4. Plasman, M. *et al*., *Biol. J. Linnean Soc.*, **128(4)**, 936-943 (2019).
5. Rekdal, S.L. *et al*., *J. Avian Biol.*, **52(5)**, doi.org/10.1111/jav.02734 (2021).
6. Dorton, Kristy L., "Effects of copper source and concentration on copper status and immune function in growing and finishing steers". Colorado State University, M.S. thesis, p. 38 (2002).
7. Lazzaroni, Sharon Marie, "Immune responses in *Burkholderia pseudomallei* infection, relapse, reactivation and protection". James Cook University, M.Sc. thesis, p. 131 (2009).
8. Yang, David Shih-Fan, "Immunomodulatory effects of interferon-alpha on T cell subsets in Behcet's disease *ex vivo*, and the *in vitro* effects of treatment on healthy donor cells". University College London, Ph.D. dissertation, p. 113 (2011).
9. Rive, Craig Michael, "The Immunopathogenesis of drug hypersensitivity". Murdoch University, Ph.D. dissertation, pp. 37, 47 (2016).
10. Zeytin, Sinem, "Towards optimisation of fish larval nutrition: the effects of new components in microdiet composition and feeding practices on larval digestive physiology". Christian-Albrechts-Universität Kiel, Dr. rer. nat. dissertation, p. 34 (2018).
11. Rieger, Jan Hendrik, "Targets of tumor-infiltrating lymphocyte reactivity in pancreatic cancer". Ruperto Carola University Heidelberg, Dr. rer. nat. dissertation, p. 28 (2019).

Notice

Technical Assistance

Visit the tech service page at SigmaAldrich.com/techservice.

Standard Warranty

The applicable warranty for the products listed in this publication may be found at SigmaAldrich.com/terms.

Contact Information

For the location of the office nearest you, go to SigmaAldrich.com/offices.

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	-		$(GlcNAc)_2$	
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

L8754pis Rev 05/22 IRB,MWM,JRC,NSB,SAG,MAP,GCY