Concanavalin A (Con A)

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INTRODUCTION

Con A is a 104,000 Da lectin (carbohydrate-binding protein) comprised of four identical subunits, and exists as an active dimer or tetramer depending upon pH. Its carbohydrate binding partners are α-D-glucose and α-D-mannose with unmodified OH groups at C-3, C-4, and C-6, and terminal glucose residues of proteins and peptides. Con A is a lectin easily isolated from the jack bean, making it a readily available tool for researchers. It has been utilized in a multitude of research projects and diagnostic assays. Cancer research, developing assays for immunoreactions, and studying bacterial mechanisms are only a few examples of how this molecule has been employed by the scientific community.

CONJUGATED CON A

Bangs Laboratories offers Con A magnetic particles as a resource for scientific investigators. Con A microparticles have binding properties similar to the Con A free protein and maintain binding activity. Zem *et. al.* illustrated microspheres linked to Con A can be an alternative to microarrays in the development of carbohydrate-based drugs in diagnostic tests.[17] While Paie *et. al.* demonstrated Con A microspheres prepared by a water-in-oil emulsion technique demonstrated properties of binding to glucose and SAPG-insulin that are similar to the literature values of these properties for unmodified Con A.[11]

Con A-coated BioMag®Plus microparticles (BP531) from Bangs Laboratories provide a convenient means for isolating mannosyl- and glucosyl-containing glycoproteins and polysaccharides from serum or cell lysate, or for investigating other lectin / glycan-mediated processes.

RESOURCES FOR LECTIN RESEARCH

Concanavalin A is one of many types of plant lectins. While we offer Con A conjugated to a magnetic particle, an investigator could also conjugate other types of lectins to polymer, silica, or dyed particles using EDAC covalent immobilization, see *TechNote 205* for more information on conjugation. Table 1 below is a list of resources available for accessing more specific information regarding lectin structure and binding capabilities.

Table 1

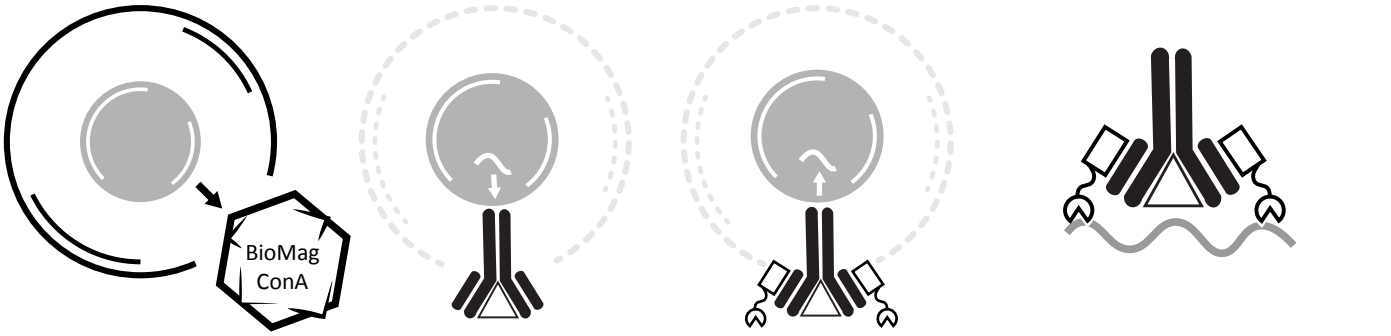
Database	Web Link	Specialty
Bacterial carbohydrate structural database	http://www.glyco.ac.ru/bcsdb	The BCSDB scope is "bacterial carbohydrates"
Carbohydrate- active enzymes	http://www.cazy.org/	The database is a dedicated family classification system that correlate with the structure and molecular mechanism of Carbohydrate-active enzymes (CAZymes).
Consortium for Functional Glycomics	http://www.functionalglycomics.org	The Functional Glycomics Gateway is a comprehensive resource for functional glycomics
UniLectin	https://www.unilectin.eu/	An interactive database dedicated to the classification and curation of lectins
Lectins and food	http://poisonousplants.ansci.cornell.edu/toxicagents/lectins.html	A focus on lectin in plants and how it affects livestock
Pathogen–sugar binding database	https://sugarbind.expasy.org/	Website that provides information on known carbohydrate sequences to which pathogenic organisms (bacteria, toxins and viruses) specifically adhere.
Plant lectin database	http://nscdb.bic.physics.iisc.ernet.in/lectindb/search.html	The lectin database contains structure and sequence information on plant lectins. The database has been completely manually annotated.

Adapted From: Nilsson, Carol L. "Lectins: Analytical Tools from Nature." Lectins, 2007, pp. 1–13., doi:10.1016/b978-044453077-6/50002-8.

CONCANAVALIN A AS A RESEARCH TOOL

The isolation of mannose-containing glycoprotein using Con A affinity chromatography has been a useful tool for investigators.[9] While Protein A chromatography is utilized in many similar types of separations, it is not a good candidate for large-scale purification because of its high cost[3]; consequently, many assays have been built around Con A.

Due to its ability to bind mannosyl- and glucosyl-containing glycoprotein present in mammalian cells, agglutination assays have been developed. These assays have been adapted for investigating tumors in canines[4], rats[7], and human systems[15]. More recently, assays have been developed using Con A as an agent to test immune responsiveness[5]. BioMag® Concanavalin A is used to adhere magnetic particles to cell nuclei for CUT&RUN, a chromatin profiling protocol that has several key advantages over chromatin immunoprecipitation (ChIP). ChIP has low efficiency due to the millions of cells required, high background from tens of millions of reads as a result of sonication, and low resolution by reading hundreds of base pairs as opposed to possible single base pair resolution, see references for more details.



Con A application is not used exclusively in mammalian systems. The properties of Con A have been utilized to probe the characteristics of microbes as well. By blocking glycoprotein receptors on cell surfaces, bacterial phenotypes can be explored with regards to receptor binding. It has been utilized in the study of bacterial cell-wall structure[6], investigations of bacterial attachment mechanisms[10], slime molds surface receptors[16], and virus interactions with mammalian cells[8].

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