Cell, Vol. 76, 597–598, February 25, 1994, Copyright © 1994 by Cell Press

Letter to the Editor

Galectins: A Family of Animal β-Galactoside-Binding Lectins

Members of a family of β-galactoside-binding lectins with related amino acid sequences, sometimes referred to as S-type or S-Lac lectins, are found in tissues of many animals, ranging from lower invertebrates such as sponges and nematodes to mammals, including humans (Hirabayashi and Kasai, 1993; Oda et al., 1993). In mammals, four members of this family have been sequenced and characterized, and there is compelling evidence for the existence of other relatives. Although the functions of these lectins are not yet fully understood, there is evidence that one or more are involved in growth regulation, cell adhesion, and cell migration and that they play roles in neoplasia and immune responses. All known members of this family lack a signal peptide, are found in the cytosol, and are isolated as soluble proteins. However, there is evidence that some members are externalized to the cell surface and extracellular matrix by an atypical secretory mechanism.

Communication about these lectins has been impeded by the lack of a generally accepted nomenclature, which has led to a proliferation of names as each lectin is rediscovered in different contexts. To facilitate communication about this family of proteins, we propose to name them galectins. Membership in the galectin family requires fulfillment of two criteria: affinity for β-galactosides and significant sequence similarity in the carbohydrate-binding site, the relevant amino acid residues of which have been determined by X-ray crystallography (Lobsanov et al., 1993). We further propose that the mammalian galectins be numbered sequentially, as has been done for many other families of proteins. The numbers assigned to the individual galectins are the same as the accepted numbers for their genes in the Genome Data Base. The proposed names for the four well-characterized mammalian galectins are as follows.

Galectin-1

GenBank/EMBL accession numbers are J04456, J05303, X14829 (human); M19036 (rat); X15986, X51903, S41202, X51578 (mouse); X14330 (bovine). Previously known as L-14-I, L-14, RL-14.5, galaptin, MGBP, GBP, BHL, CHA, HBP, HPL, HLBP 14, rIML-1, and other names, galectin-1 is isolated as a homodimer with subunit molecular weight of about 14,500, is abundant in smooth and skeletal muscle, but is also found in many other cell types. The gene encoding galectin-1 is designated in the Genome Data Base as LGALS1 (the initials designate lectin, galactoside-binding, soluble).

Galectin-2

The GenBank/EMBL accession number is M87010 (human). Previously known as L-14-II, galectin-2 is isolated as a homodimer with subunit molecular weight of 14,650 and was originally found in a hepatoma. The gene encoding galectin-2 is designated in the Genome Data Base as LGALS2.

Galectin-3

GenBank/EMBL accession numbers are J02921, M35368, M36682, M64303 (human); J02962, M13697 (rat); J03723, L08649, X16074, X16834 (mouse). Previously known as CBP-35, Mac-2, IgEBP, CBP-30, RL-29, L-29, L-31, L-34, LBL, and other names, galectin-3 is isolated as a monomer with calculated molecular weights varying between 26,200 and 30,300, depending on the species, although apparent molecular weights on SDS–polyacrylamide gels are higher. It consists of a short N-terminal domain, a proline- and glycine-rich domain of 9 amino acid repeats, and a C-terminal carbohydrate-binding domain. It is abundant in activated macrophages and in epithelial cells and is also found in other cell types. The gene encoding galectin-3 is designated in the Genome Data Base as LGALS3.

Galectin-4

The GenBank/EMBL accession number is M73553 (rat). Previously known as L-36 and RIH, galectin-4 is a monomer with molecular weight 36,300. It contains two carbohydrate-binding domains separated by a link region, within a single polypeptide chain. It is abundant in intestinal epithelium. The gene encoding galectin-4 is designated in the Genome Data Base as LGALS4.

We know of at least three other mammalian galectins, and there are tentative plans to assign to them the names galectin-5 to galectin-7. Since we suspect that other members of the family exist, we suggest that as members are discovered, they be named by consultation with other workers in the field.

Although most work is presently being done with mammalian galectins, nonmammalian galectins are attracting increasing attention. Whereas it is easy to recognize the same lectin in different mammalian species because of great conservation of amino acid sequence, it is difficult to infer the relationship of particular mammalian lectins to those found in lower vertebrates and invertebrates. Therefore, for nonmammalian galectins we suggest that specific names in current use be retained until enough is known about them to relate them to each other and to individual mammalian galectins.

Samuel H. Barondes,[1] Vincent Castronovo,[2] Douglas N. W. Cooper,[1] Richard D. Cummings,[3] Kurt Drickamer,[4] Ten Feizi,[5] Michael A. Gitt,[1] Jun Hirabayashi,[6] Colin Hughes,[7] Ken-ichi Kasai,[6] Hakon Leffler,[1] Fu-Tong Liu,[8] Reuben Lotan,[9] Arthur M. Mercurio,[10] Michel Monsigny,[11] Shiv Pillai[12] Françoise Poirer,[13] Avraham Raz,[14] Peter W. J. Rigby,[7] James M. Rini,[15] and John L. Wang[16]

[1]University of California, San Francisco
San Francisco, California 94143
[2]University of Liège
B-4000 Liège
Beligium
[3]University of Oklahoma
Oklahoma City, Oklahoma 73190

[4]Columbia University
New York, New York 10032
[5]Clinical Research Center
Harrow, Middlesex HA1 3UJ
England
[6]Teikyo University
Sagamiko, Kanagawa 199-01
Japan
[7]National Institute for Medical Research
London NW7 1AA
England
[8]Scripps Research Institute
La Jolla, California 92037
[9]M. D. Anderson Cancer Center
University of Texas
Houston, Texas 77030
[10]Harvard University Medical School
Boston, Massachusetts 02115
[11]Centre National de la Recherche Scientifique
L'Université D'Orléans
F-4507 Orléans 02
France
[12]Massachusetts General Hospital
Boston, Massachusetts 02129
[13]Institut National de la Santé
et de la Recherche Médicale
Unité 257
F-75230 Paris
France
[14]Michigan Cancer Foundation
Detroit, Michigan 48201
[15]University of Toronto
Toronto M5S1A8
Canada
[16]Michigan State University
East Lansing, Michigan 48824

References

Hirabayashi, J., and Kasai, K-i. (1993). Glycobiology *3*, 297–304.

Lobsanov Y. D., Gitt, M. A., Leffler, H., Barondes, S. H., and Rini, J. M. (1993). J. Biol. Chem. *268*, 27034–27038.

Oda, Y., Herrman, J., Gitt, M. A., Turck, C., Burlingame, A. L., Barondes, S. H., and Leffler, H. (1993). J. Biol. Chem. *268*, 5929–5939.