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ProductInformation

ALBUMIN FROM BOVINE SERUM

CAS NUMBER: 9048-46-8

SYNONYMS: Bovine Serum Albumin; Bovine Plasma Albumin; BSA

STRUCTURE:

The molecular weight of BSA has frequently been cited as 66,120[1] or 66,267[2], but it was revised in 1990 to 66,430[3]. All three values are based on amino acid sequence information available at the time of publication.

BSA is a single polypeptide chain consisting of about 583 amino acid residues and no carbohydrates. At pH 5-7 it contains 17 intrachain disulfide bridges and 1 sulfhydryl group.[1,3]

PHYSICAL PROPERTIES:

Appearance: Powder [4]
pI in Water at 25°C: Fatty Acid Depleted[8] - 5.3, Endogenous Material[5,6,7] - 4.7; 4.9;
pH of 1% Solution:[1,4] 5.2-7;
Optical Rotation:[1,9] $[\alpha]_{259}$: -61°; $[\alpha]_{264}$: -63°
Stokes Radius (r_s):[10] 3.48 nm

Sedimentation constant,[1] $S_{20,W}$ X 10^{13}	4.5 (monomer), 6.7 (dimer)
Diffusion constant,[1] $D_{20,W}$ X 10^{7}	5.9
Partial specific volume,[1] V_{20}	0.733
Intrinsic viscosity,[1] η	0.0413
Frictional ratio,[1] f/f_0	1.30
Overall dimensions,[1] Å	40 X 140
Refractive index increment[1] (578 nm) X 10^{-3}	1.90
Optical absorbance,[1] $A^{1\ gm/L}_{279nm}$	0.667
Mean residue rotation,[1] $[m']_{233}$	8443
Mean residue ellipticity[1]	21.1 $[\theta]_{209\ nm}$; 20.1 $[\theta]_{222\ nm}$
Estimated α-helix,[1] %	54
Estimated β-form,[1] %	18

SOLUBILITY / SOLUTION STABILITY:

Albumins are readily soluble in water and can only be precipitated by high concentrations of neutral salts such as ammonium sulfate. The solution stability of BSA is very good (especially if the solutions are stored as frozen aliquots). In fact, albumins are frequently used as stabilizers for other solubilized proteins (e.g., labile enzymes). However, albumin is readily coagulated by heat.[11] When heated to 50°C or above, albumin quite rapidly forms hydrophobic aggregates which do not revert to monomers upon cooling.[4] At somewhat lower temperatures aggregation is also expected to occur, but at relatively slower rates.

ALBUMIN, BOVINE

METHOD OF PREPARATION:

A. HISTORY:[1,4] Albumin is relatively simple to isolate and purify. One of the first methods of isolation involved extensive dialysis of serum against water; this process removed most globulins. A second procedure took advantage of the good solubility of albumin at low to moderate ammonium sulfate concentrations, and effected precipitation by lowering the pH. Electrophoretic isolation was also employed, as was affinity chromatography. None of these methods were applicable to large scale production.

B. INITIAL ISOLATION: Initial isolation is by Heat Treatment or by Alcohol precipitation. Most commercial preparations are now prepared by Alcohol Precipitation a method developed by E. J. Cohn and his associates in the 1940's ("Fraction V" yields albumin with a purity of about 96%) or by Heat Treatment.[12]

C. FURTHER PURIFICATION:[1,4] Additional removal of impurities can be accomplished by crystallization (a procedure which yields ∃99% pure albumin), preparative electrophoresis, ion exchange chromatography, affinity chromatography (e.g., ConA-agarose removes glycoproteins), heat treatment (removes globulins), low pH treatment, charcoal treatment, organic solvent precipitation (i.e., isooctane), and low temperature treatment.[13] Charcoal treatment and organic solvent precipitation remove fatty acids.[13]

PRODUCT DESCRIPTION / USAGE:[14]

Albumins are a group of acidic proteins which occur plentifully in the body fluids and tissues of mammals and in some plant seeds. Unlike globulins, albumins have comparatively low molecular weights, are soluble in water, are easily crystallized, and contain an excess of acidic amino acids. Serum and plasma albumin is carbohydrate-free and comprises 55-62% of the protein present.

Albumin binds water, Ca^{2+}, Na^{+}, and K^{+}. Due to a hydrophobic cleft, albumin binds fatty acids, bilirubin, hormones and drugs. The main biological function of albumin is to regulate the colloidal osmotic pressure of blood. Human and bovine albumins contain 16% nitrogen and are often used as standards in protein calibration studies. Albumin is used to solubilize lipids, and is also used as a blocking agent in Western blots or ELISA applications. Globulin free albumins are suitable for use in applications where no other proteins should be present (e.g., electrophoresis).

CHOOSING A PRODUCT:

Please refer to the table below for a complete description of each product. Based on customer input, literature reports and Sigma's own use, the following table lists product numbers which have successfully been used for specific applications. The list is not comprehensive, and product numbers not listed may often be substituted.

ALBUMIN, BOVINE

APPLICATION	PRODUCT NUMBER(S)
Antibody purification	A-2058
Binding and transport studies	A-4378, A-7030, A-0281, A-3675, A-3902, A-6003
Blood banking reagents	A-2153, A-4503, A-7888, A-3294, A-3912, A-7906, A-7030
Culture media (microbial)	A-2153, A-4503, A-3294, A-3912, A-7906, A-9430, A-7638, A-6003
Cell culture (general)	A-8806, A-9418
Electrophoresis (M.W. standard)	A-7517
ELISA (blocking reagent)	A-2153, A-4503, A-4378, A-7030, A-9430, A-3902
ELISA (non-specific binding)	A-3294
Enzyme systems	A-2153, A-4503, A-7888, A-3294, A-3912, A-4378, A-7906, A-7030, A-9430, A-7638, A-3675
Hapten carrier	A-7030, A-6003, A0281
Immunocytochemistry	A-9647, A-7906, A-6793
Immunohematology	A-2153, A-4503, A-7888, A-3294, A-3912, A-4378, A-7906, A-7030, A-0281, A-6003
Mitogenic assays	A-2058
Molecular biology	B-2518[15], B-8894[15], B-6917, B-8667, B-4287
Protein base or filler	A-2153, A-4503, A-3912, A-4378, A-7906, A-7030
Protein supplement (controls)	A-2153, A-4503, A-4378, A-7906, A-7030, A-3675
Protein standard (M.W., amino acids, nitrogen)	A-2153, A-4503, A-4378, A-7030
RIA systems	A-7888, A-4378, A-7030, A-3675, A-3902
Serology	A-4503, A-3912, A-4378, A-7906, A-7030, A-9430, A-3675

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3. Hirayama, K., *BBRC*, 173(2), 639 (1990).
4. Sigma data.
5. Dawson, R.M.C. et al., *Data for Biochemical Research*, 3rd ed., p. 381, Clarendon Press, Oxford (1993).
6. Malamud, D. and Drysdale, J.W., *Anal. Biochem.*, 86, 620 (1978).
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11. Lewis, Sr., R.J. *Hawley's Condensed Chemical Dictionary*, 12th ed., p. 30, Van Nostrand Reinhold Co., New York (1993).
12. Cohn, E.J. et al., *J. Am. Chem. Soc.*, 68, 459 (1946).
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14. Scott, T. and Eagleson, M., *Concise Encyclopedia: Biochemistry*, 2nd ed., pp. 19-20, Walter de Gruyter, New York (1988).
15. These products are acetylated to inactivate nucleases commonly found in BSA, and are thus not listed in the table of unmodified BSA's on pp. 4-9 of this data sheet. Since tyrosines in the BSA are also derivatized, these preparations are not recommended for use as protein standards.