

Protein and Peptide Purification Applications

Bio-Rad has numerous chromatographic products for the purification, characterization, and manipulation of proteins and peptides. Ion exchange, size exclusion, affinity, hydrophobic interaction, and hydroxyapatite supports are available in a number of different formats for any isolation and purification need. A number of published references utilizing Bio-Rad chromatography supports for the purification of proteins and peptides are described below.

Sample Preparation and Enzyme Assay Applications

| Application | Product | References |
|---|--------------------|---|
| Acetylglutamate from glutamate separation | AG 50W-X8 resin | Alonso E and Rubio V, Determination of N-acetyl-L-glutamate using high-performance liquid chromatography, <i>Anal Biochem</i> 146, 252–259 (1985) |
| Adenylate cyclase activity analysis | Bio-Gel® A-5m gel | Andreasen TJ et al., Photoaffinity labeling of brain adenylate cyclase preparations with azido[¹²⁵ I]iodocalmodulin, <i>Biochemistry</i> 22, 2757–2762 (1983) |
| Adenylate cyclase assay | AG 50W-X4 resin | Marcus R and Orner FB, Cyclic AMP production in rat calvaria in vitro: interaction prostaglandins with parathyroid hormone, <i>Endocrinology</i> 101, 1570–1578 (1977) Salomon Y et al., A highly sensitive adenylate cyclase assay, <i>Anal Biochem</i> 58, 541–548 (1974) |
| 3',5'-Cyclic AMP preparation | AG® 50W-X4 resin | Grant PG et al., Three new potential cAMP affinity labels. Inactivation of human platelet low K_m cAMP phosphodiesterase by 8-[[4-bromo-2,3-dioxobutyl]thio]adenosine 3',5'-cyclic monophosphate, <i>Biochemistry</i> 29, 887–894 (1990) |
| Cyclic AMP from cGMP phosphodiesterase separation | AG MP-1 resin | Hsu DS and Chen SS, Simultaneous assay of cyclic AMP and cyclic GMP phosphodiesterase activity by anion-exchange column chromatography, <i>J Chromatogr</i> 245, 369–372 (1982) |
| Cyclic AMP from cGMP separation | AG 1-X8 resin | Fallon AM and Wyatt GR, An improved assay for cyclic GMP using an insect binding protein, <i>Anal Biochem</i> 63, 614–619 (1975) Kuehl FA Jr et al., Estrogen-related increases in uterine guanosine 3':5'-cyclic monophosphate levels, <i>Proc Natl Acad Sci USA</i> 71, 1866–1870 (1974) |
| Cyclic AMP separation | AG 50W-X4 resin | Coleman DL et al., Recombinant granulocyte-macrophage colony-stimulating factor increases adenylate cyclase activity in murine peritoneal macrophages, <i>J Immunol</i> 143, 4134–4140 (1989) |
| Diaminopimelate from lysine separation | AG 50W-X8 resin | Kelland JG et al., Stereochemistry of lysine formation by meso-diaminopimelate decarboxylase from wheat germ: use of ¹ H- ¹³ C NMR shift correlation to detect stereospecific deuterium labeling, <i>Biochemistry</i> 24, 3263–3267 (1985) |
| Enzyme activity measurement | Bio-Gel A-1.5m gel | Bazzi MD and Nelsestuen GL, Differences in the effects of phorbol esters and diacylglycerols on protein kinase C, <i>Biochemistry</i> 28, 9317–9323 (1989) |
| Enzyme binding-efficiency studies | Affi-Gel® 102 gel | Bowers-Komro DM et al., Substrate specificity and variables affecting efficiency of mammalian flavin adenine dinucleotide synthetase, <i>Biochemistry</i> 28, 8439–8446 (1989) |
| GABA aminotransferase assay | AG 50W-X8 resin | Silverman RB and George C, Inactivation of γ -aminobutyric acid aminotransferase by (Z)-4-amino-2-fluorobut-2-enoic acid, <i>Biochemistry</i> 27, 3285–3289 (1988) |
| GlcNAc transferase assay | AG 1-X8 resin | Brockhausen I et al., Mucin synthesis: UDP-GlcNAc:GalNAc-R β 3-N-acetylglucosaminyl transferase and UDP-GlcNAc:GlcNAc β 1-3GalNAc-R (GlcNAc to GalNAc) β 6-N-acetylglucosaminyltransferase from pig and rat colon mucosa, <i>Biochemistry</i> 24, 1866–1874 (1985) |
| Glutamine synthetase assay | AG 1-X8 resin | Pishak MR and Phillips AT, A modified radioisotopic assay for measuring glutamine synthetase activity in tissue extracts, <i>Anal Biochem</i> 94, 82–88 (1979) |
| HMG-CoA reductase assay | AG 1-X8 resin | Edwards PA et al., Improved methods for the solubilization and assay of hepatic 3-hydroxy-3-methylglutaryl coenzyme A reductase, <i>J Lipid Res</i> 20, 40–46 (1979) |
| Inositol phosphate determination | AG 1-X8 resin | McCoy KL et al., Diminished antigen processing by endosomal acidification mutant antigen-presenting cells, <i>J Immunol</i> 143, 29–38 (1989) |

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|---|------------------|--|
| Inositol phosphate fractionation | AG 1-X8 resin | Ting AE and Pagano RE, Detection of a phosphatidylinositol-specific phospholipase C at the surface of Swiss 3T3 cells and its potential role in the regulation of cell growth, <i>J Biol Chem</i> 265, 5337–5340 (1990) |
| Inositol phosphate isolation | AG 1-X8 resin | Grier CE 3rd and Mastro AM, Lectin-induced phosphatidylinositol metabolism in lymphocytes is potentiated by macrophages, <i>J Immunol</i> 141, 2585–2592 (1988) Heathers GP et al., Anion exchange chromatographic separation of inositol phosphates and their quantification by gas chromatography, <i>Anal Biochem</i> 176, 109–116 (1989) Trenn G et al., Biochemical characterization of the inhibitory effect of CsA on cytolytic T lymphocyte effector functions, <i>J Immunol</i> 142, 3796–3802 (1989) |
| Inositol phosphate measurement | AG 1-X8 resin | Leibson PJ et al., Transmembrane signaling during natural killer cell-mediated cytotoxicity: regulation by protein kinase C activation, <i>J Immunol</i> 145, 1498–1504 (1990) |
| Inositol phosphate purification | AG 1-X2 resin | Stohl W et al., Differential CD3/T cell antigen receptor-mediated IL-2 production in jurkat T cells: dissociation of IL-2 response from total inositol phosphate and calcium responses, <i>J Immunol</i> 145, 1078–1087 (1990) |
| Inositol phosphate quantitation | AG 1-X8 resin | Le Gouvello S et al., CD2 triggering stimulates a phospholipase A2 activity beside the phospholipase C pathway in human T lymphocytes, <i>J Immunol</i> 144, 2359–2364 (1990) |
| Inositol triphosphate separation | AG 1-X8 resin | Murayama T et al., Histamine-stimulated and GTP-binding proteins-mediated phospholipase A2 activation in rabbit platelets, <i>J Biol Chem</i> 265, 4290–4295 (1990) |
| Lipoprotein lipase isolation | Bio-Gel A-5m gel | Shirai K et al., Interaction of lipoprotein lipase with phospholipid vesicles: role of apolipoprotein C-II and heparin, <i>Biochim Biophys Acta</i> 665, 504–510 (1981) |
| Methionine synthetase assay | AG 1-X8 resin | Sauer HJ and Jaenicke L, [Simple method for the assay of methionine synthetase (MS-) activity and its possible use in clinical laboratory], <i>Klin Wochenschr</i> 50, 986–990 (1972) (in German) |
| Na ⁺ , K ⁺ ATPase assay | AG 50W-X8 resin | McGill DL, Characterization of the adipocyte ghost (Na ⁺ ,K ⁺) pump: insights into the insulin regulation of the adipocyte (Na ⁺ ,K ⁺ pump), <i>J Biol Chem</i> 266, 15817–15823 (1991) |
| Phospholipase c assay | AG 1-X8 resin | Ladoux A and Frelin C, Endothelins inhibit adenylate cyclase in brain capillary endothelial cells, <i>Biochem Biophys Res Commun</i> 180, 169–173 (1991) |
| Saxitoxin (neurotoxin) assay | AG 50W-X2 resin | Li Y and Moczydlowski E, Purification and partial sequencing of saxiphilin, a saxitoxin-binding protein from the bullfrog, reveals homology to transferrin, <i>J Biol Chem</i> 266, 15481–15487 (1991) |

Protein Analysis Applications

| Application | Product | References |
|--|------------------------|--|
| 5-Methyl-L-tetrahydrofolate reductase purification | Affi-Gel Blue gel | Kattchee PA and Guynn RW, Enzymatic assay of 5-methyl-L-tetrahydrofolate, <i>Anal Biochem</i> 118, 85–90 (1981) |
| Acetylcholine receptor purification | Affi-Gel 10 gel | Andre C et al., Purification of muscarinic acetylcholine receptors by affinity chromatography, <i>EMBO J</i> 2, 499–504 (1983) |
| Adenylate cyclase purification | Affi-Gel Blue gel | Westcott KR et al., Resolution of adenylate cyclase sensitive and insensitive to Ca ²⁺ and calcium-dependent regulatory protein (CDR) by CDR-sepharose affinity chromatography, <i>Proc Natl Acad Sci USA</i> 76, 204–208 (1979) |
| Adenylyl cyclase purification (mammalian) | Bio-Gel A-5m gel | Orlando C et al., A monoclonal antibody directed against the catalytic site of <i>Bacillus anthracis</i> adenylyl cyclase identifies a novel mammalian brain catalytic subunit, <i>Biochemistry</i> 31, 3215–3222 (1992) |
| Albumin isolation | CM Affi-Gel Blue gel | Poduslo JF and Curran GL, Increased permeability across the blood-nerve barrier of albumin glycosylated in vitro and in vivo from patients with diabetic polyneuropathy, <i>Proc Natl Acad Sci USA</i> 89, 2218–2222 (1992) |
| Alcohol dehydrogenase purification (yeast) | Affi-Gel Blue gel | Weinhold EG et al., Structural determinants of stereospecificity in yeast alcohol dehydrogenase, <i>Proc Natl Acad Sci USA</i> 88, 8420–8424 (1991) |
| Alkaline phosphatase purification | DEAE Bio-Gel A gel | Hamilton TA et al., Alkaline phosphates from human milk: comparison with isoenzymes from placenta and liver, <i>Biochem J</i> 177, 197–201 (1979) |
| α-chymotrypsin purification | Affi-Gel 10 gel | Wilkinson TJ et al., Affinity chromatographic separations of chemically modified α-chymotrypsins from α-chymotrypsin, <i>Sep Sci</i> 11, 385–389 (1976) |
| α fetoprotein purification | Affi-Gel Blue gel | Miyazaki M et al., A simple method for purification of rat α-fetoprotein by Affi-Gel Blue chromatography and disc electrophoresis, <i>Acta Med Okayama</i> 35, 427–430 (1981) |
| α-MSH, ACTH, β-endorphin separation | Bio-Gel P-60 gel | Tanaka I et al., γ-Melanotrophin-like immunoreactivities in human pituitaries, ACTH-producing pituitary adenomas, and ectopic ACTH-producing tumours: evidence for an abnormality in glycosylation in ectopic ACTH-producing tumours, <i>Clin Endocrinol</i> 15, 353–361 (1981) |
| Alzheimer's-related protein | Affi-Gel 10 gel | Vincent IJ and Davies P, A protein kinase associated with paired helical filaments in Alzheimer disease, <i>Proc Natl Acad Sci USA</i> 89, 2878 (1992) |
| Amino terminal ligand coupling | CM Bio-Gel A gel | Khalifah RG et al., Carbon-13 nuclear magnetic resonance probe of active-site ionizations in human carbonic anhydrase B, <i>Biochemistry</i> 16, 2241–2247 (1977) |
| Anti-G protein antibody isolation | Affi-Gel 10/15 gel | Murakami T et al., Site-specific antibodies directed against G protein β and γ subunits: effects on α and β γ subunit interaction, <i>Biochemistry</i> 31, 2905–2911 (1992) |
| Anti-Klenow antibodies | Macro-Prep® 50 S resin | Dunn L et al., Characterization of synthetic macroporous ion-exchange resins in low-pressure cartridges and columns: evaluation of the performance of Macro-Prep 50 S resin in the purification of anti-Klenow antibodies from goat serum, <i>J Chromatogr</i> 548, 165–178 (1991) |
| Anti-myotoxin a antibodies | Affi-Gel 10 gel | Utainscharoen P et al., Binding of myotoxin α to sarcoplasmic reticulum Ca ²⁺ -ATPase: a structural study, <i>Biochemistry</i> 30, 8211–8216 (1991) |
| Apocytochrome b562 (<i>E. coli</i>) | Bio-Gel P-30 gel | Feng YQ and Sligar SG, Effect of heme binding on the structure and stability of <i>Escherichia coli</i> apocytochrome b562, <i>Biochemistry</i> 30, 10150–10155 (1991) |
| Apolipoprotein purification | Affi-Gel 10 gel | Davis RA and Boogaerts JR, Intrahepatic assembly of very low density lipoproteins: effect of fatty acids on triacylglycerol and apolipoprotein synthesis, <i>J Biol Chem</i> 257, 10908–10913 (1982) |
| ATP:AMP phosphotransferase purification | Affi-Gel Blue gel | Tomasselli AG and Noda LH, Mitochondrial ATP:AMP phosphotransferase from beef heart: purification and properties, <i>Eur J Biochem</i> 103, 481–491 (1980) |
| ATP-independent catenating enzyme purification | Bio-Gel HTP gel | Chakraborty AK and Majumder HK, An ATP-independent catenating enzyme from the kinetoplast hemoflagellate <i>Leishmania donovani</i> , <i>Biochem Biophys Res Commun</i> 180, 279–285 (1991) |
| Bactericidal protein purification | Bio-Rex® 70 resin | Wasiluk KR et al., Comparison of granule proteins from human polymorphonuclear leukocytes which are bactericidal toward <i>Pseudomonas aeruginosa</i> , <i>Infect Immun</i> 59, 4193–4200 (1991) |
| β-endorphin separation | Bio-Gel P-60 gel | Rückert RI et al., Some methodic aspects in optimizing the radioimmunoassay of β-endorphin, <i>Exp Clin Endocrinol</i> 87, 277–287 (1986) |
| Ca ²⁺ + Mg ²⁺ -ATPase purification | Affi-Gel Blue gel | Gutierrez-Merino C et al., Interaction of the local anesthetics dibucaine and tetracaine with sarcoplasmic reticulum membranes: differential scanning calorimetry and fluorescence studies, <i>Biochemistry</i> 28, 3398–3406 (1989) |
| Ca/Cam-sensitive PDE assay | AG 1-X2 resin | Ahn HS et al., Evidence for essential histidine and cysteine residues in calcium/calmodulin-sensitive cyclic nucleotide phosphodiesterase, <i>Biochemistry</i> 30, 6754–6760 (1991) |
| Calcineurin assay | AG 50W-X4 resin | Swanson SK et al., Cyclosporin-mediated inhibition of bovine calcineurin by cyclophilins A and B, <i>Proc Natl Acad Sci USA</i> 89, 3741–3745 (1992) |

| Application | Product | References |
|--|------------------------------------|--|
| Calcium binding studies | Bio-Gel P-10 gel | Coan C and DiCarlo R, Effect of diethyl pyrocarbonate modification on the calcium binding mechanism of the sarcoplasmic reticulum ATPase, <i>J Biol Chem</i> 265, 5376–5384 (1990) |
| Calmodulin binding protein purification | Affi-Gel 10 gel | Wallace RW et al., High levels of a heat-labile calmodulin-binding protein (CaM-BP80) in bovine neostriatum, <i>Biochemistry</i> 19, 1831–1837 (1980) |
| | Bio-Gel A-1.5m gel | Andreasen TJ et al., Purification of a novel calmodulin binding protein from bovine cerebral cortex membranes, <i>Biochemistry</i> 22, 4615–4618 (1983) |
| Calmodulin purification | Affi-Gel 10 gel | Caldwell CR and Haug A, Affinity chromatographic isolation of calmodulin from bovine-brain acetone powder, <i>Anal Biochem</i> 116, 325–330 (1981) |
| Capsid virus concentration | Hydroxyapatite | Smith RG and Lee SA, Large-scale isolation and partial purification of type C RNA viruses on hydroxyapatite: 1. biochemical characterization, <i>Anal Biochem</i> 86, 252–263 (1978) |
| Carbohydrate antigen characterization | Bio-Gel P-2 gel | Hanisch FG et al., Structure of tumor-associated carbohydrate antigen Ca 19-9 on human seminal-plasma glycoproteins from healthy donors, <i>Eur J Biochem</i> 144, 467–473 (1984) |
| Carbonic anhydrase purification | CM Bio-Gel A gel | Khalifah RG et al., Carbon-13 nuclear magnetic resonance probe of active-site ionizations in human carbonic anhydrase B, <i>Biochemistry</i> 16, 2241–2247 (1977) |
| Cardiotoxin purification | Bio-Gel P-10 gel | Kini RM and Evans HJ, Role of cationic residues in cytolytic activity: modification of lysine residues in the cardiotoxin from <i>Naja nigricollis</i> venom and correlation between cytolytic and antiplatelet activity, <i>Biochemistry</i> 28, 9209–9215 (1989) |
| Casein kinase I purification | Affi-Gel Blue gel | Chaudhry PS et al., Casein kinase I in bovine sperm: purification and characterization, <i>Biochem Biophys Res Commun</i> 179, 592–598 (1991) |
| CD45 protein tyrosine phosphatase purification | Affi-Gel Blue gel | Cho H et al., Catalytic domains of the LAR and CD45 protein tyrosine phosphatases from <i>Escherichia coli</i> expression systems: purification and characterization for specificity and mechanism, <i>Biochemistry</i> 31, 133–138 (1992) |
| CF transmembrane regulator purification | Bio-Gel HT gel | Bear CE et al., Purification and functional reconstitution of the cystic fibrosis transmembrane conductance regulator (CFTR), <i>Cell</i> 68, 809–818 (1992) |
| cGMP phosphodiesterase assay | AG 1-X2 resin | Lem J et al., Retinal degeneration is rescued in transgenic <i>rd</i> mice by expression of the cGMP phosphodiesterase β subunit, <i>Proc Natl Acad Sci USA</i> 89, 4422–4426 (1992) |
| Chaperonin-60 (GroEL) purification | Affi-Gel Blue gel | Fisher MT, Promotion of the in vitro renaturation of dodecameric glutamine synthetase from <i>Escherichia coli</i> in the presence of GroEL (chaperonin-60) and ATP, <i>Biochemistry</i> 31, 3955–3963 (1992) |
| Choline acetyltransferase purification | DEAE Bio-Gel A gel | Slemmon JR et al., Purification of choline acetyltransferase from <i>Drosophila melanogaster</i> , <i>J Biol Chem</i> 257, 3847–3852 (1982) |
| Chromosomal protein fractionation | Hydroxyapatite | Simon RH and Felsenfeld G, A new procedure for purifying histone pairs H2A + H2B and H3 + H4 from chromatin using hydroxylapatite, <i>Nucleic Acids Res</i> 6, 689–696 (1979) |
| Chymotrypsin affinity column | Affi-Gel 10 gel | Hurle MR et al., Denaturant-dependent folding of bovine pancreatic trypsin inhibitor mutants with two intact disulfide bonds, <i>Biochemistry</i> 29, 4410–4419 (1990) |
| CNBr fragment separation | Bio-Gel A-1.5m gel | Osmand AP et al., Partial amino-acid sequences of human and rabbit C-reactive proteins: homology with immunoglobulins and histocompatibility antigens, <i>Proc Natl Acad Sci USA</i> 74, 1214–1218 (1977) |
| Complement component C3 isolation | Bio-Gel A-0.5m gel; hydroxyapatite | Horstmann RD and Muller-Eberhard HJ, Isolation of rabbit C3, Factor B, and Factor H and comparison of their properties with those of the human analog, <i>J Immunol</i> 134, 1094–1100 (1985) |
| Core histone isolation | Hydroxyapatite | Prevelige PE Jr and Fasman GD, Structural studies of acetylated and control inner core histones, <i>Biochemistry</i> 26, 2944–2955 (1987) |
| Creatine kinase isoenzyme separation (batch) | AG MP-1 resin | Morin LG, Improved separation of creatine kinase cardiac isoenzyme in serum by batch fractionation, <i>Clin Chem</i> 22, 92–97 (1976) |
| Cyclic AMP receptor protein purification | Bio-Rex 70 resin | Heyduk T and Lee JC, <i>Escherichia coli</i> cAMP receptor protein: evidence for three protein conformational states with different promoter binding affinities, <i>Biochemistry</i> 28, 6914–6924 (1989) |
| Cyclic nucleotide phosphodiesterase purification | Affi-Gel Blue gel | Sharma RK et al., Purification and properties of bovine brain calmodulin-dependent cyclic nucleotide phosphodiesterase, <i>J Biol Chem</i> 255, 5916–5923 (1980) |
| Cystamine affinity column | Affi-Gel 10 gel | Li L et al., Functional role of the cysteine 451 thiol group in the M4 helix of the α subunit of <i>Torpedo californica</i> acetylcholine receptor, <i>Biochemistry</i> 29, 5428–5436 (1990) |
| Cystic fibrosis mucociliary inhibitor purification | CM Bio-Gel A gel | Carson SD and Bowman BH, Cystic fibrosis: I. fractionation of the mucociliary inhibitor from plasma, <i>Pediatr Res</i> 16, 13–20 (1982) |
| Cytochrome c derivative purification | Bio-Rex 70 resin | Durham B et al., Photoinduced electron-transfer kinetics of singly labeled ruthenium bis(bipyridine) dicarboxybipyridine cytochrome c derivatives, <i>Biochemistry</i> 28, 8659–8665 (1989) |
| Cytochrome c peroxidase purification | Bio-Gel HTP gel | Corin AF et al., Effects of surface amino acid replacements in cytochrome c peroxidase on complex formation with cytochrome c, <i>Biochemistry</i> 30, 11585–11595 (1991) |

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|---|-------------------------------------|---|
| Cytochrome c purification (<i>R. sphaeroides</i>) | Bio-Gel HTP gel | Konishi K et al., Preparation and characterization of the water-soluble heme-binding domain of cytochrome c1 from the <i>Rhodobacter sphaeroides</i> bc1 complex, J Biol Chem 266, 14270–14276 (1991) |
| Cytochrome c subunit separation | Bio-Gel P-100 gel | Millett F et al., Identification of specific carboxylate groups on cytochrome c oxidase that are involved in binding cytochrome c, Biochemistry 22, 546–552 (1983) |
| Cytokine isolation | Bio-Gel P-30 gel | Maizel A et al., Biochemical separation of a human B cell mitogenic factor, Proc Natl Acad Sci USA 79, 5998–6002 (1982) |
| Diadenosine tetraphosphate binding protein purification | DEAE Bio-Gel A gel | Vishwanatha JK and Lei Z, Diadenosine tetraphosphate binding protein from human HeLa cells: purification and characterization, Biochemistry 31, 1631–1635 (1992) |
| DNA-dependent adenosine-triphosphatase A purification | Affi-Gel Hz gel | Mesner LD et al., DNA-dependent adenosinetriphosphatase A is the eukaryotic analogue of the bacteriophage T4 gene 44 protein: immunological identity of DNA replication-associated ATPases, Biochemistry 30, 11490–11494 (1991) |
| DnaK chaperone protein purification | Bio-Gel P-60 gel | Liberek K et al., The <i>Escherichia coli</i> DnaK chaperone, the 70-kDa heat shock protein eukaryotic equivalent, changes conformation upon ATP hydrolysis, thus triggering its dissociation from a bound target protein, J Biol Chem 266, 14491–14496 (1991) |
| DNA purification | Bio-Gel HTP gel | Eastman A, Analysis and quantitation of the DNA damage produced in cells by the cisplatin analog cis-[³ H]dichloro(ethylenediamine)platinum (II), Anal Biochem 197, 311–315 (1991) |
| <i>E. coli</i> growth inhibitor immobilization | Affi-Gel 10 gel | LaPorte DC et al., Inhibition of <i>Escherichia coli</i> growth and respiration by polymyxin B covalently attached to agarose beads, Biochemistry 16, 1642–1648 (1977) |
| <i>E. coli</i> rep protein purification | Bio-Rex 70 resin | Scott JF and Kornberg A, Purification of the rep protein of <i>Escherichia coli</i> : an ATPase which separates duplex DNA strands in advance of replication, J Biol Chem 253, 3292–3297 (1978) |
| <i>E. coli</i> transcriptional factor purification | Hydroxyapatite | Liberek K et al., The DnaK chaperone modulates the heat shock response of <i>Escherichia coli</i> by binding to the sigma 32 transcription factor, Proc Natl Acad Sci USA 89, 3516–3520 (1992) |
| Enkephalin measurement | Bio-Gel P-2 gel | Mocchetti I et al., Use of mRNA hybridization and radioimmunoassay to study mechanisms of drug-induced accumulation of enkephalins in rat brain structures, Mol Pharmacol 28, 86–91 (1985) |
| Enzyme concentration | Affi-Gel Blue gel | Im DS and Muzyczka N, The AAV origin binding protein Rep68 is an ATP-dependent site-specific endonuclease with DNA helicase activity, Cell 61, 447–457 (1990) |
| Epidermal growth factor purification | Bio-Rex 70 resin | Savage CR Jr and Harper R, Human epidermal growth factor/urogastrone: rapid purification procedure and partial characterization, Anal Biochem 111, 195–202 (1981) |
| | Bio-Gel P-10 gel | Kohda D and Inagaki F, Structure of epidermal growth factor bound to perdeuterated dodecylphosphocholine micelles determined by two-dimensional NMR and simulated annealing calculations, Biochemistry 31, 677–685 (1992) |
| Epidermal growth factor receptor purification | Affi-Gel 10 gel | Cohen S et al., Epidermal growth factor-receptor-protein kinase interactions: co-purification of receptor and epidermal growth factor-enhanced phosphorylation activity, J Biol Chem 255, 4834–4842 (1980) |
| Erythrocyte reductase purification | Bio-Gel P-100 gel | Xu F et al., Characterization of NADPH-dependent methemoglobin reductase as a heme-binding protein present in erythrocytes and liver, Proc Natl Acad Sci USA 89, 2130–2134 (1992) |
| Estradiol binding | Affi-Gel heparin gel | Peale FV Jr et al., Rapid purification of the estrogen receptor by sequence-specific DNA affinity chromatography, Biochemistry 28, 8671–8675 (1989) |
| Estrogen receptor purification | Bio-Gel A-0.5m gel | McNaught RW et al., Receptor interconversion model of hormone action: 1. purification of a factor involved in conferring estradiol binding properties to the estrogen receptor, Biochemistry 29, 2685–2690 (1990) |
| | DEAE Bio-Gel A gel | Dayani N et al., Receptor interconversion model of hormone action: 2. requirement of both kinase and phosphatase activities for conferring estrogen binding activity to the estrogen receptor, Biochemistry 29, 2691–2698 (1990) McNaught RW et al., Receptor interconversion model of hormone action: 1. purification of a factor involved in conferring estradiol binding properties to the estrogen receptor, Biochemistry 29, 2685–2690 (1990) |
| Excreted protein purification | Affi-Gel 10 gel | Dong JM and Sahagian GG, Basis for low affinity binding of a lysosomal cysteine protease to the cation-independent mannose 6-phosphate receptor, J Biol Chem 265, 4210–4217 (1990) |
| Exonuclease purification | Bio-Rex 70 resin; hydroxyapatite | Perrino FW and Loeb LA, Hydrolysis of 3'-terminal mispairs in vitro by the 3'→5' exonuclease of DNA polymerase δ permits subsequent extension by DNA polymerase α , Biochemistry 29, 5226–5231 (1990) |
| Factor B-rab antigen isolation | Bio-Rex 70 resin | Horstmann RD and Muller-Eberhard HJ, Isolation of rabbit C3, Factor B, and Factor H and comparison of their properties with those of the human analog, J Immunol 134, 1094–1100 (1985) |
| Factor XI (recombinant) purification | Affi-Prep® 10 support | Hamaguchi N et al., Expression and characterization of human factor IX: factor IX _{thr-397} and factor IX _{val-397} , J Biol Chem 266, 15213–15220 (1991) |

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| Ferric uptake regulation protein purification | Bio-Gel P-100 gel | Coy M and Neilands JB, Structural dynamics and functional domains of the fur protein, <i>Biochemistry</i> 30, 8201–8210 (1991) |
| Fetuin fractionation | Bio-Gel A-5m gel | Kumbala L et al., Association of a lipoprotein-like particle with bovine fetuin, <i>FASEB J</i> 3, 2075–2080 (1989) |
| Fibronectin purification | Affi-Gel 10 gel | Coller BS, Interaction of normal, thrombasthenic, and Bernard-Soulier platelets with immobilized fibrinogen: defective platelet-fibrinogen interaction in thrombasthenia, <i>Blood</i> 55, 169–178 (1980) |
| FixL <i>Rhizobium</i> nitrogen fixation protein purification | Bio-Gel HT gel | Monson EK et al., The FixL protein of <i>Rhizobium meliloti</i> can be separated into a heme-binding oxygen-sensing domain and a functional C-terminal kinase domain, <i>Proc Natl Acad Sci USA</i> 89, 4280–4284 (1992) |
| Formyltetrahydrofolate synthetase from spinach leaves | Bio-Gel HTP gel | Nour JM and Rabinowitz JC, Isolation, characterization, and structural organization of 10-formyltetrahydrofolate synthetase from spinach leaves, <i>J Biol Chem</i> 266, 18363–18369 (1991) |
| Fusion protein affinity column | Affi-Gel 15 gel | Kovary K and Bravo R, The jun and fos protein families are both required for cell cycle progression in fibroblasts, <i>Mol Cell Biol</i> 11, 4466–4472 (1991) |
| | Affi-Gel 15 gel | Kuhn R et al., The gene encoding the transcription factor SCIP has features of an expressed retroposon, <i>Mol Cell Biol</i> 11, 4642–4650 (1991) |
| Galactosyltransferase cleavage | Bio-Gel P-2 gel | Hesford FJ et al., Identification of the product formed by human erythrocyte galactosyltransferase, <i>Biochim Biophys Acta</i> 659, 302–311 (1981) |
| Gentamicin purification from serum | Bio-Rex 70 resin | Habbal ZM, Spectrofluorometric assay of gentamicin in serum, <i>Clin Chim Acta</i> 95, 301–309 (1979) |
| Glia-derived nexin purification | Bio-Gel P-10 gel | Rovelli G et al., Characterization of the heparin-binding site of glia-derived nexin/protease nexin-1, <i>Biochemistry</i> 31, 3542–3549 (1992) |
| Glutamate transporter from glycoprotein | Hydroxyapatite | Danbolt NC et al., Purification and reconstitution of the sodium- and potassium-coupled glutamate transport glycoprotein from rat brain, <i>Biochemistry</i> 29, 6734–6740 (1990) |
| Glutamine synthase purification | Affi-Gel 10 gel | Chung HK and Rhee SG, Separation of glutamine synthetase species with different states of adenylation by chromatography on monoclonal anti-AMP antibody affinity columns, <i>Proc Natl Acad Sci USA</i> 81, 4677–4681 (1984) |
| Glutamine synthetase purification | Affi-Gel Blue gel | Miller ES and Brenchley JE, L-Methionine SR-sulfoximine-resistant glutamine synthetase from mutants of <i>Salmonella typhimurium</i> , <i>J Biol Chem</i> 256, 11307–11312 (1981) |
| Glycogen synthase kinase purification | Affi-Gel 15 gel | Hemmings BA et al., Purification of glycogen synthase kinase 3 from rabbit skeletal muscle: copurification with the activating factor (FA) of the (Mg-ATP) dependent protein phosphatase, <i>Eur J Biochem</i> 119, 443–451 (1981) |
| Glycopeptide analysis | Bio-Gel P-6 gel | Garver FA et al., Localization of the carbohydrate units in a human immunoglobulin light chain, protein Sm λ , <i>Eur J Biochem</i> 115, 643–652 (1981) |
| | | Turco SJ and Pickard JL, Altered G-protein glycosylation in vesicular stomatitis virus-infected glucose-deprived baby hamster kidney cells, <i>J Biol Chem</i> 257, 8674–8679 (1982) |
| Glycopeptide fractionation | Bio-Gel P-4 gel | Shimamura M et al., Evidence for unique homologous peptide sequences around the glycosylated seryl and threonyl residues in polysialoglycoproteins isolated from the unfertilized eggs of the Pacific salmon <i>Oncorhynchus keta</i> , <i>Biochemistry</i> 24, 5470–5480 (1985) |
| Glycopeptide identification | Bio-Gel P-4 gel | Pan YT and Elbein AD, Control of N-linked oligosaccharide synthesis: cellular levels of dolichyl phosphate are not the only regulatory factor, <i>Biochemistry</i> 29, 8077–8084 (1990) |
| Glycopeptide isolation | Bio-Gel P-4 gel | Kaushal GP et al., Purification to homogeneity and properties of mannosidase II from mung bean seedlings, <i>Biochemistry</i> 29, 2168–2176 (1990) |
| | Bio-Gel P-6 gel | Chandrasekaran EV et al., Structures of sialylated O-glycosidically and N-glycosidically linked oligosaccharides in a monoclonal immunoglobulin light chain, <i>J Biol Chem</i> 256, 1549–1555 (1981) |
| Glycopeptide separation | Bio-Gel P-4 gel | Tropea JE et al., Australine, a pyrrolizidine alkaloid that inhibits amyloglucosidase and glycoprotein processing, <i>Biochemistry</i> 28, 2027–2034 (1989) |
| Glycoprotein affinity column | Affi-Gel Hz gel | Morehead HW et al., Optimization of oxidation of glycoproteins: an assay for predicting coupling to hydrazide chromatographic supports, <i>J Chromatogr</i> 587, 171–176 (1991) |
| Glycoprotein analysis | Bio-Gel P-100 gel | Slomiany BL et al., Fatty acid acylation of salivary mucin in rat submandibular glands, <i>Arch Biochem Biophys</i> 242, 402–410 (1985) |
| | Bio-Gel P-4 gel | Turco SJ and Pickard JL, Altered G-protein glycosylation in vesicular stomatitis virus-infected glucose-deprived baby hamster kidney cells, <i>J Biol Chem</i> 257, 8674–8679 (1982) |
| Glycoprotein purification | Bio-Gel P-6 gel | Calvo FO and Ryan RJ, Inhibition of adenylyl cyclase activity in rat corpora luteal tissue by glycopeptides of human chorionic gonadotropin and the α -subunit of human chorionic gonadotropin, <i>Biochemistry</i> 24, 1953–1959 (1985) |
| | Hydroxyapatite | Gorbunoff MJ et al., Purification of ovomucoid by hydroxyapatite chromatography, <i>J Chromatogr</i> 187, 224–228 (1980) |

| Application | Product | References |
|--|------------------------|---|
| GMP reductase purification | Affi-Gel Blue gel | Spector T et al., Reaction mechanism and specificity of human GMP reductase: substrates, inhibitors, activators, and inactivators, <i>J Biol Chem</i> 254, 2308–2315 (1979) |
| Growth factor characterization | Bio-Gel P-10 gel | Stromberg K and Hudgins WR, Urinary transforming growth factors in neoplasia: separation of ¹²⁵ I-labeled transforming growth factor-alpha from epidermal growth factor in human urine, <i>Cancer Res</i> 46, 6004–6010 (1986) |
| | Bio-Gel P-60 gel | Kudlow JE and Kobrin MS, Secretion of epidermal growth factor-like mitogens by cultured cells from bovine anterior pituitary glands, <i>Endocrinology</i> 115, 911–917 (1984) |
| GTPase-activating protein purification | Bio-Gel A-1.5m gel | Holden JL et al., Rsr1 and Rap1 GTPases are activated by the same GTPase-activating protein and require threonine 65 for their activation, <i>J Biol Chem</i> 266, 16992–16995 (1991) |
| hCG receptor purification | Affi-Gel 10 gel | Dufau ML et al., Gonadotropin receptors: solubilization and purification by affinity chromatography, <i>J Biol Chem</i> 250, 4822–4824 (1975) |
| Heat shock protein purification | Affi-Gel protein A gel | Ikawa S and Weinberg RA, An interaction between p21ras and heat shock protein hsp60, a chaperonin, <i>Proc Natl Acad Sci USA</i> 89, 2012–2016 (1992) |
| HeLa RAR binding factor purification | DEAE Bio-Gel A gel | Leid M et al., Purification, cloning, and RXR identity of the HeLa cell factor with which RAR or TR heterodimerizes to bind target sequences efficiently, <i>Cell</i> 68, 377–395 (1992) |
| Hemoglobin A1 from A2 separation | DEAE Bio-Gel A gel | Morin LG, Rapid estimation of hemoglobin A2 without chromatography or electrophoresis, <i>Clin Chem</i> 21, 1490–1492 (1975) |
| Hemoglobin separation from blood | Bio-Rex 70 resin | Ersser RS et al., Packing materials suitable for rapid, analytical, low-pressure chromatography of haemoglobins on midget columns, <i>Biomed Chromatogr</i> 1, 183–188 (1986) |
| Heparin fragment isolation | Bio-Gel P-6 gel | Horne A and Gettins P, ¹ H NMR spectroscopic studies on the interactions between human plasma antithrombin III and defined low molecular weight heparin fragments, <i>Biochemistry</i> 31, 2286–2294 (1992) |
| Hepatitis B surface antigen isolation | Affi-Gel 10 gel | Persing DH et al., A frameshift mutation in the pre-S region of the human hepatitis B virus genome allows production of surface antigen particles but eliminates binding to polymerized albumin, <i>Proc Natl Acad Sci USA</i> 82, 3440–3444 (1985) |
| Histamine fractionation | Bio-Rex 70 resin | Schwartzman RM and Halliwell RE, Thin-layer chromatographic assays of histamine and its metabolites in urine of man and dog, <i>J Chromatogr</i> 115, 129–138 (1975) |
| Histone H1 coupling | Affi-Gel 10 gel | Mazus B et al., Histone formation, gene expression, and zinc deficiency in <i>Euglena gracilis</i> , <i>Biochemistry</i> 23, 42–47 (1984) |
| Histone H1 purification | Bio-Gel P-100 gel | Breeuwer M and Goldfarb DS, Facilitated nuclear transport of histone H1 and other small nucleophilic proteins, <i>Cell</i> 60, 999–1008 (1990) |
| Histone purification | Bio-Rex 70 resin | D'Anna JA et al., Circular dichroic and sedimentation studies of phosphorylated H1 from Chinese hamster cells, <i>Biochemistry</i> 18, 942–951 (1979) |
| | | Walker J et al., Affinity chromatography of mammalian and yeast nucleosomes: two modes of binding of transcriptionally active mammalian nucleosomes to organomercurial-agarose columns, and contrasting behavior of the active nucleosomes of yeast, <i>J Biol Chem</i> 265, 5736–5746 (1990) |
| HSA coupling | CM Bio-Gel A gel | Harper JR et al., Protein A-bearing <i>Staphylococcus aureus</i> as the solid phase in an enzyme immunoassay and its application to determination of urinary albumin, <i>Clin Chem</i> 28, 2378–2382 (1982) |
| Immunoliposome isolation | Bio-Gel A-1.5m gel | Pinnaduwa P and Huang L, Stable target-sensitive immunoliposomes, <i>Biochemistry</i> 31, 2850–2855 (1992) |
| Initiation factor 2 purification | Bio-Rex 70 resin | Stringer EA et al., Purified eukaryotic initiation factor 2 from calf liver consists of two polypeptide chains of 48,000 and 38,000 daltons, <i>J Biol Chem</i> 254, 6845–6848 (1979) |
| Injurin purification | Bio-Gel P-60 gel | Matsumoto K et al., Identification and characterization of "injurin," an inducer of expression of the gene for hepatocyte growth factor, <i>Proc Natl Acad Sci USA</i> 89, 3800–3804 (1992) |
| Inositol 1,3-bisphosphate assay | Dowex® AG 1-X8 resin | Caldwell KK et al., Isolation and characterization of two 3-phosphatases that hydrolyze both phosphatidylinositol 3-phosphate and inositol 1,3-bisphosphate, <i>J Biol Chem</i> 266, 18378–18386 (1991) |
| Inositol phosphatase | Bio-Gel HTP | Caldwell KK et al., Isolation and characterization of two 3-phosphatases that hydrolyze both phosphatidylinositol 3-phosphate and inositol 1,3-bisphosphate, <i>J Biol Chem</i> 266, 18378–18386 (1991) |
| Insulin receptor purification | Affi-Gel 10 gel | Waugh SM et al., Isolation of a proteolytically derived domain of the insulin receptor containing the major site of cross-linking/binding, <i>Biochemistry</i> 28, 3448–3455 (1989) |
| | Affi-Gel 15 gel | Roth RA and Cassell DJ, Insulin receptor: evidence that it is a protein kinase, <i>Science</i> 219, 299–301 (1983) |

| Application | Product | References |
|---|--|--|
| Interferon γ receptor purification | Affi-Prep 10 support | Fountoulakis M et al., A 25-kDa stretch of the extracellular domain of the human interferon γ receptor is required for full ligand binding capacity, <i>J Biol Chem</i> 266, 14970–14977 (1991) |
| Isocitrate dehydrogenase purification | Affi-Gel Blue gel | Garnak M and Reeves HC, Purification and properties of phosphorylated isocitrate dehydrogenase of <i>Escherichia coli</i> , <i>J Biol Chem</i> 254, 7915–7920 (1979) Vasquez B and Reeves HC, NADP-specific isocitrate dehydrogenase of <i>Escherichia coli</i> : IV. purification by chromatography on Affi-Gel Blue, <i>Biochim Biophys Acta</i> 578, 31–40 (1979) |
| Lactate dehydrogenase isoenzyme separation | AG MP-1 resin | Menon MP et al., Measurement of lactate dehydrogenase isoenzyme 1/isoenzyme 2 ratio by a batch separation method, <i>J Chromatogr</i> 378, 450–455 (1986) |
| Lambda phage cI repressor | Affi-Gel Blue gel | Beckett D et al., Quantitative study of protein association at picomolar concentrations: the lambda phage cI repressor, <i>Anal Biochem</i> 196, 69–75 (1991) |
| Lecithin:cholesterol acyltransferase purification | Affi-Gel Blue gel | Ryan RO et al., Human apolipoprotein A-I liberated from high-density lipoprotein without denaturation, <i>Biochemistry</i> 31, 4509–4514 (1992) |
| Lipo peptide purification | Bio-Gel P-2 gel | Macquaire F et al., Peptide secondary structure induced by a micellar phospholipidic interface: proton NMR conformational study of a lipopeptide, <i>Biochemistry</i> 31, 2576–2582 (1992) |
| Lipoprotein/apolipoprotein reassociation | Bio-Gel A-1.5m gel | Sehayek E and Eisenberg S, Mechanisms of inhibition by apolipoprotein C of apolipoprotein E-dependent cellular metabolism of human triglyceride-rich lipoproteins through the low density lipoprotein receptor pathway, <i>J Biol Chem</i> 266, 18259–18267 (1991) |
| Lipoprotein fractionation | Hydroxyapatite | Kostner GM and Holasek A, The separation of human serum high density lipoproteins by hydroxy apatite column chromatography: evidence for the presence of discrete subfractions, <i>Biochim Biophys Acta</i> 488, 417–431 (1977) |
| Lipoprotein isolation | Bio-Gel A-5m gel Bio-Sil® HA silica | Charlton SC and Smith LC, Kinetics of transfer of pyrene and rac-1-oleyl-2-[4-(3-pyrenyl)-butanoyl]glycerol between human plasma lipoproteins, <i>Biochemistry</i> 21, 4023–4030 (1982) Miller KW and Small DM, Triolein-cholesteryl oleate-cholesterol-lecithin emulsions: structural models of triglyceride-rich lipoproteins, <i>Biochemistry</i> 22, 443–451 (1983) |
| Liposome preparation | Bio-Gel A 1.5m gel | Zhou F et al., An improved method of loading pH-sensitive liposomes with soluble proteins for class I restricted antigen presentation, <i>J Immunol Methods</i> 145, 143–152 (1991) |
| Liposome purification | Bio-Gel A-1.5m gel | Reddy R et al., In vivo cytotoxic T lymphocyte induction with soluble proteins administered in liposomes, <i>J Immunol</i> 148, 1585–1589 (1992) |
| Lysozyme purification | Bio-Rex 70 resin | Matei L, One-step desorption and purification of hen egg-white lysozyme from Amberlite CG-50, <i>Rev Roum Biochim</i> 23, 45–49 (1986) |
| MB creatine kinase purification | Affi-Gel Blue gel | Herman CA and Roberts R, Purification and immunological characterization of human myocardial MB creatine kinase, <i>Anal Biochem</i> 106, 244–252 (1980) |
| Membrane glycoprotein purification | Affi-Gel 10 gel | Knudsen KA et al., Membrane glycoproteins involved in cell-substratum adhesion, <i>Proc Natl Acad Sci USA</i> 78, 6071–6075 (1981) |
| Membrane protein purification | Hydroxyapatite | Engel WD et al., Ubiquinol-cytochrome c reductase (EC 1.10.2.2): isolation in Triton X-100 by hydroxyapatite and gel chromatography: structural and functional properties, <i>Biochim Biophys Acta</i> 592, 211–222 (1980) |
| Methylenetetrahydrofolate reductase purification | Affi-Gel Blue gel | Matthews RG and Haywood BJ, Inhibition of pig liver methylenetetrahydrofolate reductase by dihydrofolate: some mechanistic and regulatory implications, <i>Biochemistry</i> 30, 4845–4851 (1979) |
| Microsomal fraction receptors | DEAE Bio-Gel A gel | Sakai S et al., Separation of rabbit mammary-gland prolactin receptors by ion-exchange chromatography, h.p.l.c.-gel filtration and ultracentrifugation, <i>Biochem J</i> 237, 647–653 (1986) |
| Microsomal P1 kinase purification | Hydroxyapatite | Ganong BR, Bimodal lipid substrate dependence of phosphatidylinositol kinase, <i>Biochemistry</i> 29, 6904–6910 (1990) |
| Microsome-associated protein fractionation | Bio-Gel A-5m gel; hydroxyapatite | Wetterau JR and Zilversmit DB, A triglyceride and cholesteryl ester transfer protein associated with liver microsomes, <i>J Biol Chem</i> 259, 10863–10866 (1984) |
| Mn peroxidase purification | DEAE Bio-Gel A gel | Pease EA et al., Heterologous expression of active manganese peroxidase from <i>Phanerochaete chrysosporium</i> using the baculovirus expression system, <i>Biochem Biophys Res Commun</i> 179, 897–903 (1991) |
| Mouse embryo factor (MEF) isolation | Bio-Gel P-60 gel | Proper JA et al., Mouse embryos contain polypeptide growth factor(s) capable of inducing a reversible neoplastic phenotype in nontransformed cells in culture, <i>J Cell Physiol</i> 110, 169–174 (1982) |
| Myosin and kinase separation | Bio-Gel A-1.5m gel | Cote GP et al., Amino acid sequence of a segment of the <i>Acanthamoeba</i> myosin II heavy chain containing all three regulatory phosphorylation sites, <i>J Biol Chem</i> 259, 12781–12787 (1984) |
| Myosin light chain monoclonal antibodies | Affi-Gel Protein A MAPS® II kit | Boey W et al., Uncoupling of actin-activated myosin ATPase activity from actin binding by a monoclonal antibody directed against the N-terminus of myosin light chain 1, <i>Biochemistry</i> 31, 4090–4095 (1992) |

| Application | Product | References |
|--|------------------------|---|
| Nerve growth factor receptor purification | Affi-Gel 15 gel | Grob PM et al., Affinity labeling and partial purification of nerve growth factor receptors from rat pheochromocytoma and human melanoma cells, <i>Proc Natl Acad Sci USA</i> 80, 6819–6823 (1983) |
| Neurotoxin purification | Bio-Rex 70 resin | Karlsson E et al., Chromatographic separation of <i>Enhydryna schistosa</i> (common sea snake) venom and the characterization of two principal neurotoxins, <i>Biochemistry</i> 11, 4628–4633 (1972) |
| Neurotrophic factor purification | Bio-Gel P-60 gel | Radziejewski C et al., Dimeric structure and conformational stability of brain-derived neurotrophic factor and neurotrophin-3, <i>Biochemistry</i> 31, 4431–4436 (1992) |
| Origin of replication binding protein purification | Bio-Gel HTP gel | Rabkin SD and Hanlon B, Nucleoprotein complex formed between herpes simplex virus UL9 protein and the origin of DNA replication: inter- and intramolecular interactions, <i>Proc Natl Acad Sci USA</i> 88, 10946–10950 (1991) |
| Paralytic shellfish poison characterization | Bio-Gel P-2 gel | Asakawa M et al., Studies on PSP paralytic shellfish poison compositions when heated under pressure on related to the canning process of toxic scallops, <i>Bull Fac Fish Hokkaido Univ</i> 37, 252–256 (1986) |
| Peptide affinity column | Affi-Gel 10 gel | Roussel RR et al., Selective binding of activated pp60c-src by an immobilized synthetic phosphopeptide modeled on the carboxyl terminus of pp60c-src, <i>Proc Natl Acad Sci USA</i> 88, 10696–10700 (1991) |
| | Affi-Gel 10 gel | Peng C et al., A new isoform of human membrane-bound IgE, <i>J Immunol</i> 148, 129–136 (1992) |
| | Affi-Gel 10 gel | Moores SL et al., Sequence dependence of protein isoprenylation, <i>J Biol Chem</i> 266, 14603–14610 (1991) |
| | Affi-Gel 10 gel | Usheva A et al., Specific interaction between the nonphosphorylated form of RNA polymerase II and the TATA-binding protein, <i>Cell</i> 69, 871–881 (1992) |
| Peptide chromatography | Bio-Gel P-4 gel | Sekiguchi K and Titani K, Probing molecular polymorphism of fibronectins with antibodies directed to the alternatively spliced peptide segments, <i>Biochemistry</i> 28, 3293–3298 (1989) |
| Peptide coupling | Affi-Gel 10 gel | Bayer R, Topological disposition of the sequences -QRKIVE- and -KETYY in native (Na ⁺ + K ⁺)-ATPase, <i>Biochemistry</i> 29, 2251–2256 (1990) |
| Peptide desalting | Bio-Gel P-2 gel | Shoelson SE et al., Mutations at the dimer, hexamer, and receptor-binding surfaces of insulin independently affect insulin-insulin and insulin-receptor interactions, <i>Biochemistry</i> 31, 1757–1767 (1992) |
| Peptide fractionation | Bio-Gel P-4 gel | Tellerova K et al., Urinary peptides in rheumatic diseases separation by reversed-phase high-performance liquid chromatography, <i>J Chromatogr</i> 273, 197–201 (1983) |
| Peptide I-III synthesis | Bio-Beads® S-X1 beads | Takahashi S, Conformation of membrane fusion-active 20-residue peptides with or without lipid bilayers: implication of alpha-helix formation for membrane fusion, <i>Biochemistry</i> 29, 6257–6264 (1990) |
| Peptide isolation | Bio-Gel P-30 gel | Hatakeyama T et al., Identification of the tryptophan residue located at the low-affinity saccharide binding site of ricin D, <i>J Biochem (Tokyo)</i> 100, 781–788 (1986) |
| Peptide purification | Bio-Rex 70 resin | Wilson SP et al., Purification of peptides derived from proenkephalin A on Bio-Rex 70, <i>J Neurosci Methods</i> 15, 155–163 (1985) |
| | Bio-Gel P-2 gel | Schmidt J et al., Covalently modified peptides isolated from aspartate aminotransferase after reaction with pyridoxal 5'-sulfate, <i>Biochemistry</i> 21, 5220–5224 (1982) |
| | Bio-Gel P-4 gel | Komoriya A et al., The minimal essential sequence for a major cell type-specific adhesion site (CS1) within the alternatively spliced type III connecting segment domain of fibronectin is leucine-aspartic acid-valine, <i>J Biol Chem</i> 266, 15075–15079 (1991) |
| Peptide ratio determination | Bio-Gel P-6 gel | McLane KE et al., Identification of sequence segments forming the α -bungarotoxin binding sites on two nicotinic acetylcholine receptor α subunits from the avian brain, <i>J Biol Chem</i> 266, 15230–15239 (1991) |
| Peptide specific antibody purification | Affi-Gel 10 gel | Kaplan DR et al., PDGF beta-receptor stimulates tyrosine phosphorylation of GAP and association of GAP with a signaling complex, <i>Cell</i> 61, 125–133 (1990) |
| Phosphatidylcholine/phosphatidylinositol transfer protein purification | DEAE Affi-Gel Blue gel | Aitken JF et al., The gene encoding the phosphatidylinositol transfer protein is essential for cell growth, <i>J Biol Chem</i> 265, 4711–4717 (1990) |
| Phosphodiesterase purification | Affi-Gel Blue gel | Wallace RW et al., Purification and characterization of an inhibitor protein of brain adenylate cyclase and cyclic nucleotide phosphodiesterase, <i>J Biol Chem</i> 254, 377–382 (1979) |
| | DEAE Bio-Gel A gel | Kincaid RL and Vaughan M, Affinity chromatography of brain cyclic nucleotide phosphodiesterase using 3-(2-pyridyl)dithio)propionyl-substituted calmodulin linked to thiol-sepharose, <i>Biochemistry</i> 22, 826–830 (1983) |
| Phosphoenolpyruvate mutase purification | Bio-Gel HTP gel | Seidel HM et al., Phosphonate biosynthesis: molecular cloning of the gene for phosphoenolpyruvate mutase from <i>Tetrahymena pyriformis</i> and overexpression of the gene product in <i>Escherichia coli</i> , <i>Biochemistry</i> 31, 2598–2608 (1992) |

| Application | Product | References |
|--|--------------------|--|
| Phosphoprotein purification | Bio-Gel P-60 gel | Franco R and Rosenfeld MG, Hormonally inducible phosphorylation of a nuclear pool of ribosomal protein S6, J Biol Chem 265, 4321–4325 (1990) |
| Plasma protein separation | Affi-Gel Blue gel | Gianazza E and Arnaud P, Chromatography of plasma proteins on immobilized Cibacron Blue F3-GA: mechanism of the molecular interaction, Biochem J 203, 637–641 (1982) |
| Plasminogen activator purification | Affi-Gel Blue gel | Gilbert LC and Wachsman JT, Characterization and partial purification of the plasminogen activator from human neuroblastoma cell line, SK-N-SH: a comparison with human urokinase, Biochim Biophys Acta 704, 450–460 (1982) |
| Plasmin removal from plasminogen | Affi-Gel 10 gel | Bouma BN et al., Human plasma prekallikrein: studies of its activation by activated factor XII and of its inactivation by diisopropyl phosphofluoridate, Biochemistry 19, 1151–1160 (1980) |
| Platelet-derived growth factor purification | Bio-Gel P-60 gel | Drozdoff V and Pledger WJ, Cellular response to platelet-derived growth factor (PDGF)-AB after down-regulation of PDGF α -receptors: evidence that functional binding does not require alpha-receptors, J Biol Chem 266, 17165–17172 (1991) |
| Platelet factor separation | Affi-Gel 501 gel | Mcdonagh J et al., Affinity chromatography of human plasma and platelet factor XIII on organomercurial agarose, Biochim Biophys Acta 446, 345–357 (1976) |
| Polymerase purification | Affi-Gel 10 gel | Wahl AF et al., Immunoaffinity purification and properties of a high molecular weight calf thymus DNA α -polymerase, Biochemistry 23, 1895–1899 (1984) |
| Porin (bovine) purification | Bio-Gel HTP gel | De Pinto V et al., Peptide-specific antibodies and proteases as probes of the transmembrane topology of the bovine heart mitochondrial porin, Biochemistry 30, 10191–10200 (1991) |
| Progesterone receptor purification | Affi-Gel 10 gel | Edwards DP et al., Heat shock alters the composition of heteromeric steroid receptor complexes and enhances receptor activity in vivo, Biochemistry 31, 2482–2491 (1992) |
| Proliferating cell nuclear antigen purification | DEAE Bio-Gel A gel | Shivji KK et al., Proliferating cell nuclear antigen is required for DNA excision repair, Cell 69, 367–374 (1992) |
| Protein affinity chromatography | Affi-Gel 102 gel | Tucker RF et al., Protein dye affinity chromatography using immobilized tetraiodofluorescein, J Biol Chem 256, 10993–10998 (1981) |
| Protein kinase C purification | Hydroxyapatite | Mahoney CW et al., Effects of suramin, an anti-human immunodeficiency virus reverse transcriptase agent, on protein kinase C: differential activation and inhibition of protein kinase C isozymes, J Biol Chem 265, 5424–5428 (1990) Newton AC and Koshland DE Jr., Phosphatidylserine affects specificity of protein kinase C substrate phosphorylation and autophosphorylation, Biochemistry 29, 6656–6661 (1990) |
| Protein kinase inhibitor peptide affinity column | Affi-Gel 10 gel | Cheley S and Bayley H, Kinetics and regulation of two catalytic subunits of cAMP-dependent protein kinase from <i>Aplysia californica</i> , Biochemistry 30, 10246–10255 (1991) |
| Prothrombin (recombinant) purification | Affi-Gel 15 gel | Le Bonniec BF and Esmon CT, Glu-192→Gln substitution in thrombin mimics the catalytic switch induced by thrombomodulin, Proc Natl Acad Sci USA 88, 7371–7375 (1991) |
| Recombinant cytochrome purification | HTP | Bruschi M et al., Biochemical and spectroscopic characterization of the high molecular weight cytochrome c from <i>Desulfovibrio vulgaris</i> Hildenborough expressed in <i>Desulfovibrio desulfuricans</i> G200, Biochemistry 31, 3281–3288 (1992) |
| Restriction endonuclease purification | Bio-Rex 70 resin | Greene PJ et al., A general method for the purification of restriction enzymes, Nucleic Acids Res 5, 2373–2380 (1978) |
| Rho protein purification | Bio-Rex 70 resin | Brennan CA and Platt T, Mutations in an RNP1 consensus sequence of Rho protein reduce RNA binding affinity but facilitate helicase turnover, J Biol Chem 266, 17296–17305 (1991) |
| Riboflavin binding protein purification | Affi-Gel 102 gel | Merrill AH Jr et al., Purification of riboflavin-binding proteins from bovine plasma and discovery of a pregnancy-specific riboflavin-binding protein, J Biol Chem 254, 9362–9364 (1979) |
| RNA polymerase purification | Bio-Gel A-1.5m gel | Wellington SR and Spiegelman GB, Separation of <i>Escherichia coli</i> RNA polymerase sigma-70 holoenzyme from core enzyme on heparin-Sepharose columns, Biochem Biophys Res Commun 179, 1107–1114 (1991) |
| Saliva lysozyme purification | Bio-Rex 70 resin | Vasstrand EN and Jensen HB, Affinity chromatography of human saliva lysozyme and effect of pH and ionic strength on lytic activity, Scand J Dent Res 88, 219–228 (1980) |
| Scaffolding protein of phage lambda isolation | Affi-Gel Blue gel | Ziegelhoffer T et al., The purification and properties of the scaffolding protein of bacteriophage lambda, J Biol Chem 267, 455–461 (1992) |
| Serine/threonine kinase purification | Bio-Rex 70 resin | Maru Y and Witte ON, The BCR gene encodes a novel serine/threonine kinase activity within a single exon, Cell 67, 459–468 (1991) |
| Serum albumin purification | Affi-Gel Blue gel | Day JF et al., Nonenzymatic glucosylation of rat albumin: studies in vitro and in vivo, J Biol Chem 254, 9394–9400 (1979) |
| Serum complement purification | Affi-Gel Blue gel | Gee AP et al., Interaction between components of the human classical complement pathway and immobilized Cibacron Blue F3GA, J Immunol Methods 30, 119–126 (1979) |

| Application | Product | References |
|--|--------------------|---|
| Serum fractionation | Bio-Gel A-0.5m gel | Jennings HJ et al., Unique intermolecular bactericidal epitope involving the homosialo-polysaccharide capsule on the cell surface of group B <i>Neisseria meningitidis</i> and <i>Escherichia coli</i> K1, <i>J Immunol</i> 142, 3585–3591 (1989) |
| Serum protein separation | DEAE Bio-Gel A gel | Peterson EA, Ion-exchange displacement chromatography of serum proteins, using carboxymethyl dextrans as displacers, <i>Anal Biochem</i> 90, 767–784 (1978) |
| Sickle hemoglobin purification | Bio-Rex 70 resin | Russu IM and Ho C, A proton nuclear magnetic resonance investigation of histidyl residues in sickle hemoglobin, <i>Biochemistry</i> 21, 5044–5051 (1982) |
| sn-Glycerol-3-phosphate acyltransferase purification | Bio-Gel HTP gel | Scheideler MA and Bell RM, Characterization of active and latent forms of the membrane-associated sn-glycerol-3-phosphate acyltransferase of <i>Escherichia coli</i> , <i>J Biol Chem</i> 266, 14321–14327 (1991) |
| Synthetic peptide affinity column | Affi-Gel 10 gel | Schmidt A et al., Involvement of pertussis toxin-sensitive G-proteins in the hormonal inhibition of dihydropyridine-sensitive Ca ²⁺ currents in an insulin-secreting cell line (RINm5F), <i>J Biol Chem</i> 266, 18025–18033 (1991) |
| Synthetic peptide immobilization | Affi-Prep 10 gel | Drake FH et al., Biochemical and pharmacological properties of p170 and p180 forms of topoisomerase II, <i>Biochemistry</i> 28, 8154–8160 (1989) |
| Synthetic peptide purification | Bio-Gel P-2 gel | Cholin S et al., Biologic activity of a C2-derived peptide: demonstration of a specific interaction with guinea pig lung tissues, <i>J Immunol</i> 142, 2401–2404 (1989) |
| Telomerase purification | Affi-Gel 10 gel | Greider CW, Telomerase is processive, <i>Mol Cell Biol</i> 11, 4572–4580 (1991) |
| Thrombin and fibrinogen purification column | Econo-Pac® 10DG | De Cristofaro R and Di Cera E, Modulation of thrombin-fibrinogen interaction by specific ion effects, <i>Biochemistry</i> 31, 257–265 (1992) |
| Thymidylate synthetase purification | Affi-Gel Blue gel | Bisson LF and Thorner J, Thymidylate synthetase from <i>Saccharomyces cerevisiae</i> : purification and enzymic properties, <i>J Biol Chem</i> 256, 12456–12462 (1981) |
| | Bio-Gel P-150 gel | Lockshin A et al., Thymidylate synthetase purified to homogeneity from human leukemic cells, <i>Proc Natl Acad Sci USA</i> 76, 750–754 (1979) |
| Topoisomerase I purification | Hydroxyapatite | Hertzberg RP et al., On the mechanism of topoisomerase I inhibition by camptothecin: evidence for binding to an enzyme-DNA complex, <i>Biochemistry</i> 28, 4629–4638 (1989) |
| Topoisomerase purification | Hydroxyapatite | Saijo M et al., Purification and characterization of type II DNA topoisomerase from mouse FM3A cells: phosphorylation of topoisomerase II and modification of its activity, <i>Biochemistry</i> 29, 583–590 (1990) |
| Transcriptional activator OccR purification | Bio-Gel A-1.5m gel | Wang L et al., The <i>A. tumefaciens</i> transcriptional activator <i>OccR</i> causes a bend at a target promoter, which is partially relaxed by a plant tumor metabolite, <i>Cell</i> 69, 659–667 (1992) |
| Transcription factor inhibitory protein purification | Bio-Gel HT gel | Link E et al., Purified I K B-β is inactivated upon dephosphorylation, <i>J Biol Chem</i> 267, 239–246 (1992) |
| Transcription-repair coupling factor purification | DEAE Bio-Gel A gel | Selby CP et al., <i>Escherichia coli mfd</i> mutant deficient in “mutation frequency decline” lacks strand-specific repair: in vitro complementation with purified coupling factor, <i>Proc Natl Acad Sci USA</i> 88, 11574–11578 (1991) |
| Tryptic fragment separation | Bio-Gel A-1.5m gel | Rizzolo LJ and Tanford C, Denaturation of the tryptic fragments of the calcium (II) adenosine triphosphatase from sarcoplasmic reticulum by guanidinium hydrochloride, <i>Biochemistry</i> 17, 4044–4048 (1978) |
| Tubulin purification | Bio-Gel P-10 gel | Mejillano MR et al., GTP analogues interact with the tubulin exchangeable site during assembly and upon binding, <i>Biochemistry</i> 29, 1208–1216 (1990) |
| | DEAE Bio-Gel A gel | Garland DL, Kinetics and mechanism of colchicine binding to tubulin: evidence for ligand-induced conformational change, <i>Biochemistry</i> 17, 4266–4272 (1978) |
| Urinary estriol in pregnant women | AG 1-X2 resin | Habrioux G, High-performance liquid chromatographic determination of urinary estriol during pregnancy, <i>Pharm Biol</i> 143, 33–35 (1983) |
| Yeast DNA polymerase | Hydroxyapatite | Miles J and Formosa T, Protein affinity chromatography with purified yeast DNA polymerase α detects proteins that bind to DNA polymerase, <i>Proc Natl Acad Sci USA</i> 89, 1276–1280 (1992). |



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