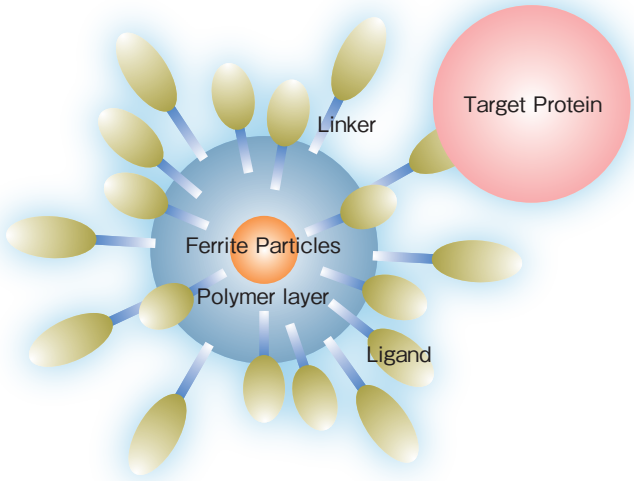
Highly functionalized
Magnetic Nanoparticles

FG beads®

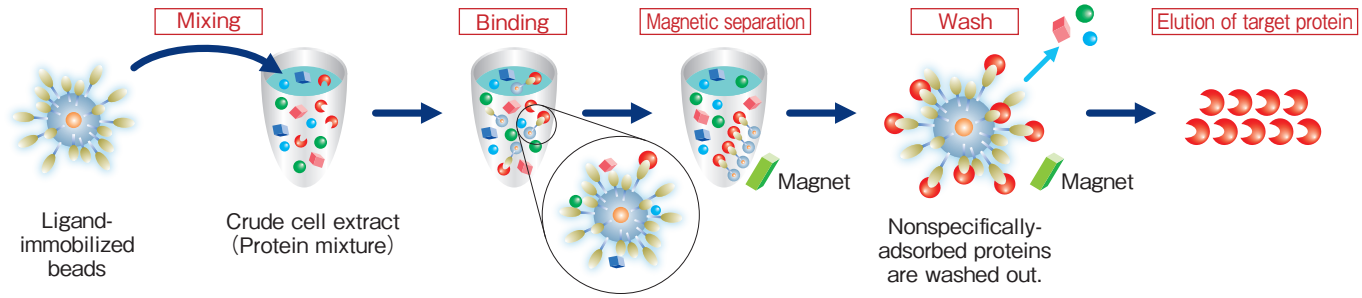
Tamagawa TAMAGAWA SEIKI CO.,LTD.

FG beads® are carriers for affinity purification having superior characteristics.

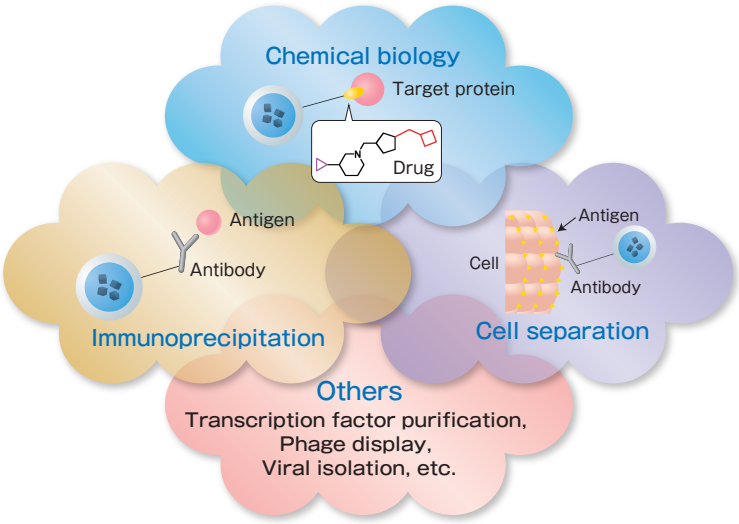
FG beads®, are approximately 0.2 μm in diameter and are composed of a plurality ferrite particles coated with a unique polymer called poly-GMA (glycidyl methacrylate). FG beads®, that are manufactured by using this original technology, are used as a carrier for affinity purification and provide characteristics that are superior to conventional carriers, allowing one-step purification of the target proteins. The development of an automated screening system, that magnetically separates and disperses FG beads®, makes it possible to automate the affinity purification process. Concequently, the simultaneous process of multiple samples and time shortening of the process are enabled.



One-step purification



Various applications



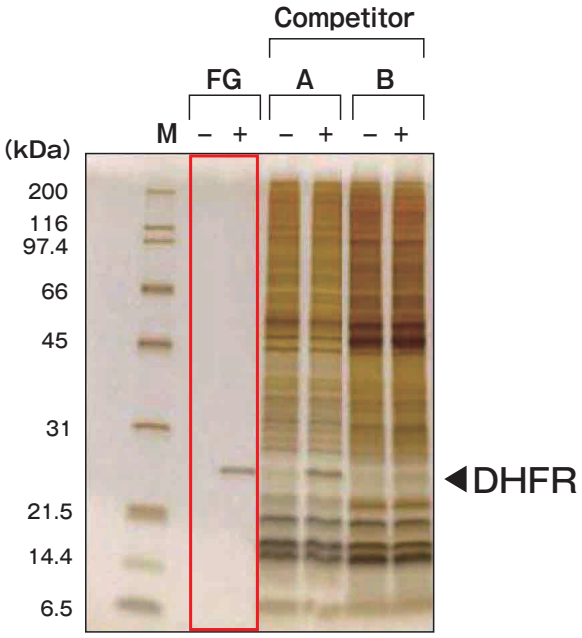
It is possible to immobilize a variety of substances, including chemicals (drugs), proteins, and DNA on FG beads®. From the various types of FG beads®, you enable to select the beads type with the optimal modification of the surface according to the functional groups of the substances you want to immobilize. The ligands-immobilized beads enable to be used for affinity purifications of the target biological substances.

CONTENTS

FG beads® Three characteristics

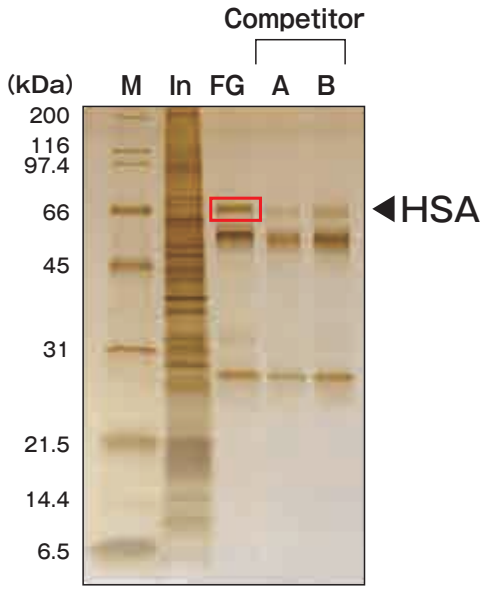
High purity

Because the surfaces of FG beads® are coated with poly-GMA, non-specific protein adsorption is extremely low.



High recovery

Because FG beads®, that are nano-size, have a large surface area, target proteins are efficiently bound to them.



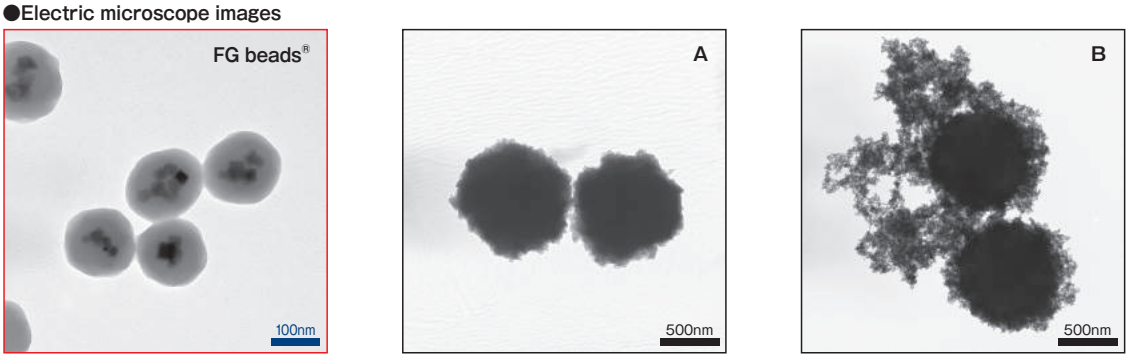
Non-specific protein adsorption is improved

We immobilized methotraxate (MTX) which was an anticancer agent by a similar method to the several magnetic beads and screened the target proteins.
We confirmed FG beads® have
*extremely lower background noise.
*higher recovery of DHFR, which is one of the target protein of MTX.

High recovery

We immobilized anti-HSA on several magnetic beads and carried out the immunoprecipitation.
The results show that FG beads® have the largest recovered amount.

●Electric microscope images



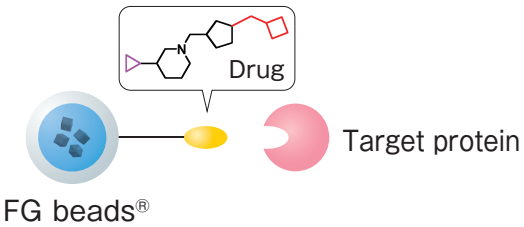
Resistance to organic solvents

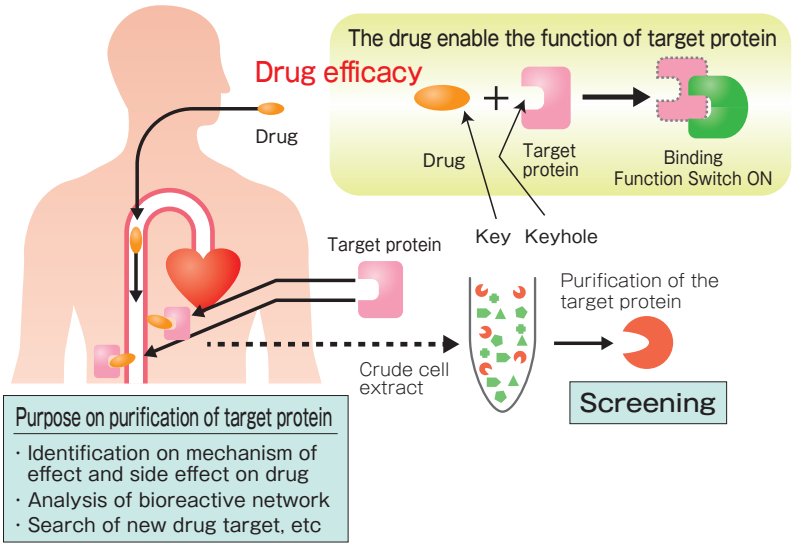
Ligands enable to be immobilized on the surfaces of FG beads® in various organic solvents such as DMF, DMSO, THF, ethyl acetate, pyridine, dioxane, toluene, dichloromethane, chloroform, etc.

Chemical biology

What is Chemical biology

Chemical biology is an academic field based on organic compounds and applied it to the field of biochemistry. The FG beads® are used as carriers for affinity purification (chemical pull-down) of target proteins.
The FG beads® are powerful tool for researchers because various ligands enable to be immobilized on the beads and non-specific protein adsorption is extremely low.

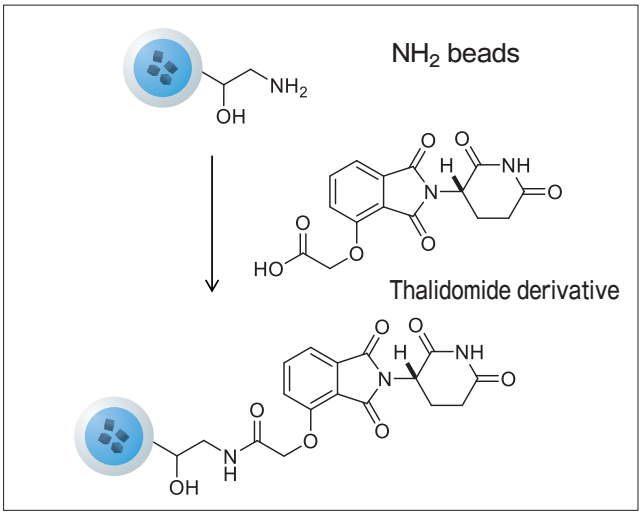


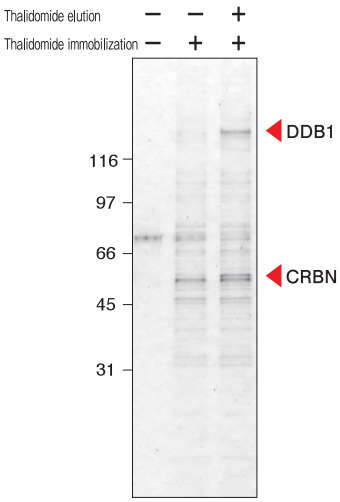


Purpose on purification of target protein

- Identification on mechanism of effect and side effect on drug
- Analysis of bioreactive network
- Search of new drug target, etc

Search for target protein of Thalidomide (elucidation of the teratogenic mechanism)



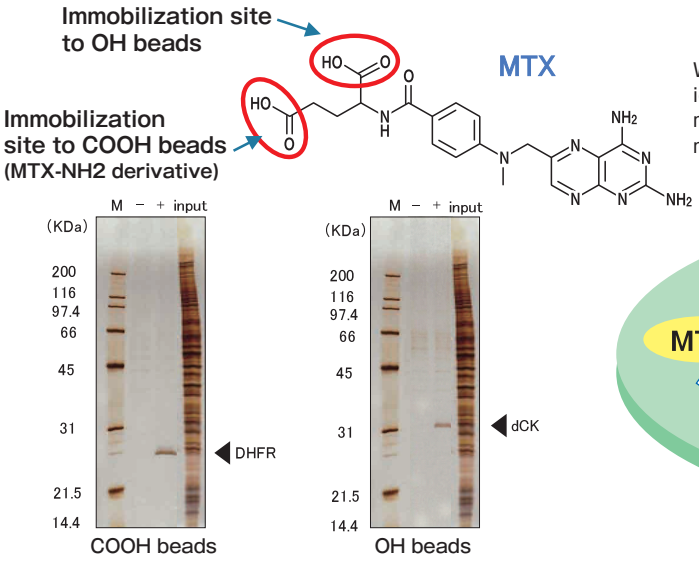


This study was published in Science.

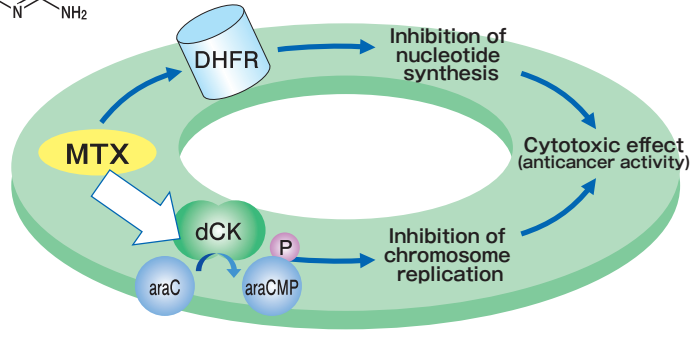
CRBN (Cereblon) and DDB1 are isolated from human cell extract by using thalidomide-immobilized beads. As a result, the teratogenic mechanism of thalidomide was elucidated.

T. Ito et al., Science 327 (2010) 1345

Purification of novel target protein of MTX (methotrexate)

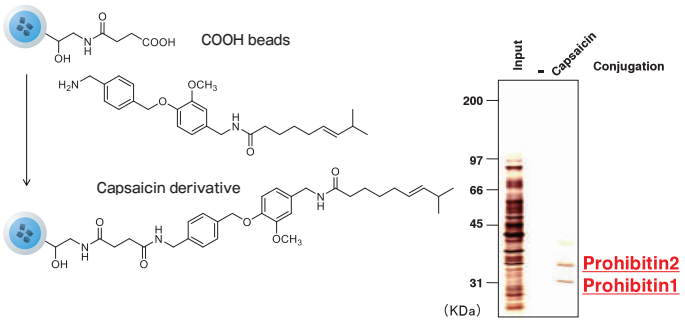


When MTX is fixed via different site, a novel protein is purified and identified as deoxycytidine kinase (dCK). As a result, a possible mechanism of synergistic effect between MTX and ara-C on malignant lymphoma was proposed.



H. Uga et al., Mol. Pharmacol. 70(2006)1832

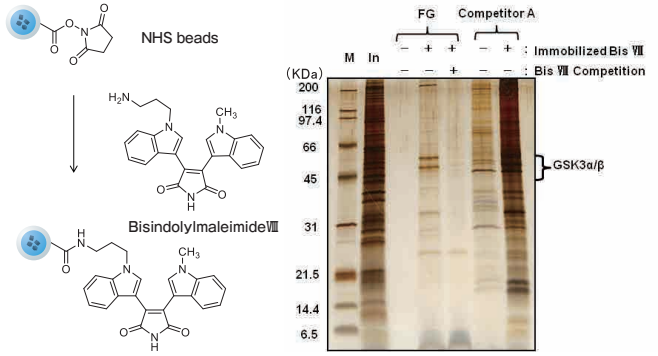
Purification of target proteins of Capsaicin



Prohibitin 1 and prohibitin 2 are isolated from human myeloid leukemia NB4 cell extract using capsaicin derivative (Cap-NH2)-immobilized beads. As a result, the apoptosis induction mechanism of capsaicin was elucidated.

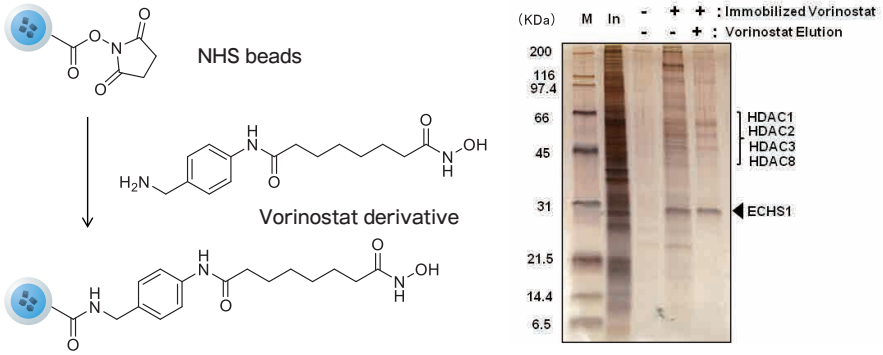
C.Kuramori et al., Biochem. Biophys. Res. Commun. 379(2009)519

Purification of target proteins of Kinase inhibitor : Bisindolylmaleimide Ⅷ



Bisindolylmaleimide Ⅷ (Bis Ⅷ) was immobilized on FG beads® and competitor A to perform affinity purification of bound proteins from HeLa cell extract.
As a result, several binding proteins were separated and one of major proteins, bound to Bis Ⅷ immobilized beads was GSK3*α/β*, confirmed by western blotting and mass spectrometry.

Purification of target proteins of HDAC inhibitor : Vorinostat



Vorinostat (SAHA) is known as one of the HDAC inhibitors. Vorinostat was immobilized on FG beads® to perform affinity purification of bound proteins from HeLa cell extract.
As a result, several binding proteins were separated. Several proteins were eluted with free vorinostat, and it was suggested that these proteins specifically interact with vorinostat. Four types of HDAC were confirmed by western blotting, and ECHS1 was identified by mass spectrometry.

Chemical biology related products

FG beads®

Product Number	Product Name	Ligand	Concentration	Quantity	Protocols for ligand immobilization
TAS8848N1110	Linker beads	R-NH_2 Amino group, R-OH Phenolic hydroxyl group	20mg/ml	5mg 20mg	【003】Immobilization of ligands (compounds with phenol groups or NH2 groups) on epoxy beads
TAS8848N1120	OH beads	R-COOH Carboxyl group	20mg/ml	5mg 20mg	【004】Immobilization of ligands (carboxylic compounds) on OH beads
TAS8848N1130	NH_2 beads	R-COOH Carboxyl group	20mg/ml	5mg 20mg	【005】Immobilization of ligands (carboxylic compounds) on NH2 beads
TAS8848N1140	COOH beads	R-NH_2／R-NHR' Amino group	20mg/ml	5mg 20mg	【008】Immobilization of ligands (compounds with NH2 groups) on COOH beads
TAS8848N1141	NHS beads	R-NH_2／R-NHR' Amino group	20mg/ml	5mg 10mg 20mg	【014】Immobilization of ligands (compounds with NH2 groups) on NHS beads
TAS8848N1160	Azide beads	Alkyne compounds	20mg/ml	5mg 10mg 20mg	【109】Immobilization of ligands (alkyne structure compounds) on Azide beads using click chemistry reaction
TAS8848N1161	Alkyne beads	Azide compounds	20mg/ml	5mg 10mg 20mg	【111】Immobilization of ligands (azido structure compounds) on Alkyne beads using click chemistry reaction
TAS8848N1170	Streptavidin beads	Biotinylated compounds	20mg/ml	5mg 10mg 20mg	【108】Immobilization of biotinylated molecule on Streptavidin beads and NeutrAvidin™ beads
TAS8848N1171	NeutrAvidin™ beads	Biotinylated compounds	20mg/ml	5mg 10mg 20mg	【108】Immobilization of biotinylated molecule on Streptavidin beads and NeutrAvidin™ beads

★NeutrAvidin™ is a trademark of Thermo Fisher Scientific, Inc. and its subsidiaries.
★Other surface modifications are also possible. Ex.)SH beads, Maleimide beads, etc.
★The protocol for screening by using ligand-immobilized beads is【001】.
★Protocols such as competitive inhibition and drug elution can also be downloaded from website.

Buffer kit

Product Number	Product Name	Kit Contents	Quantity	Protocol
TAB1200N0330	Screening Buffer Kit	・100 mM KCl buffer, DTT(−), PMSF(−) 1) ・1M KCl buffer , DTT(−), PMSF(−) 2)	75ml 2ml	【001】Screening by using ligand-immobilized beads (Affinity purification)

Buffer

Product Number	Product Name	Quantity	Use	Protocol
TAB1200N0331	100 mM KCl buffer, DTT(−), PMSF(−) 1)	100ml	Affinity purification binding/washing buffer	【001】Screening by using ligand-immobilized beads (Affinity purification)
TAB1200N0332	1M KCl buffer , DTT(−), PMSF(−) 2)	100ml	Affinity purification salt elution buffer	

1) Composition 20mM HEPES-NaOH(pH7.9), 100 mM KCl, 1mM $MgCl_2$, 0.2 mM $CaCl_2$, 0.2mM EDTA, 10%(w/v) glycerol, 0.1%(w/v) NP-40
☆When using, add DTT and PMSF so that the final concentration become 1 mM and 0.2 mM, respectively
2) Composition 20mM HEPES-NaOH(pH7.9), 1 M KCl, 1mM $MgCl_2$, 0.2mM $CaCl_2$, 0.2mM EDTA, 10%(w/v) glycerol, 0.1%(w/v) NP-40
☆When using, add DTT and PMSF so that the final concentration become 1 mM and 0.2 mM, respectively
★Please use PMSF prepared just before use.

Immunoprecipitation

In immunoprecipitation, the target protein is recovered with high purity and high recovery, that are the characteristics on FG beads®

⟨FG beads® for Immunoprecipitation⟩

■Linker beads, COOH beads and NHS beads

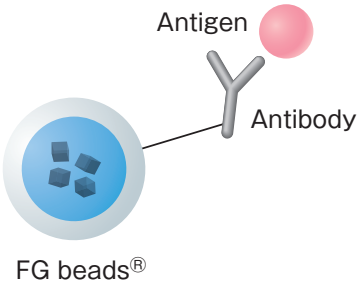
Directly immobilize antibody on beads using activated functional groups. Since antibody is immobilized via covalent bond, elution of antibody is low, and non-specific protein adsorption derived from ligand proteins is also suppressed.

■Streptavidin beads and NeutrAvidin™ beads

Immobilize the biotinylated antibody. It can be used for both direct and indirect methods.

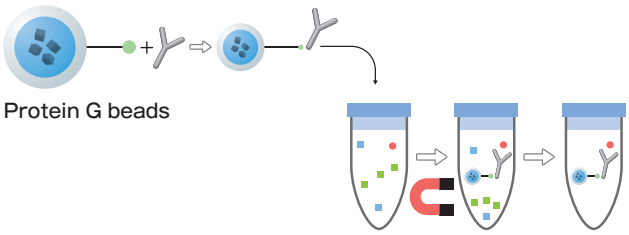
■Protein A beads and Protein G beads

Immobilize using protein-protein interaction. It can be used for both direct and indirect methods. In addition to being able to carry out easily with less experimental procedures, immobilization can be done at the Fc site of the antibody, so immobilization in the state where the antigen recognition site always faces outward is possible.



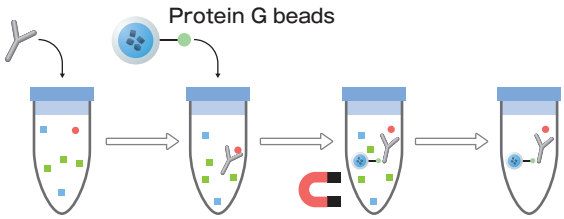
Direct method

Antibodies were bound to beads first, then antigens were separated by antibody immobilized beads.

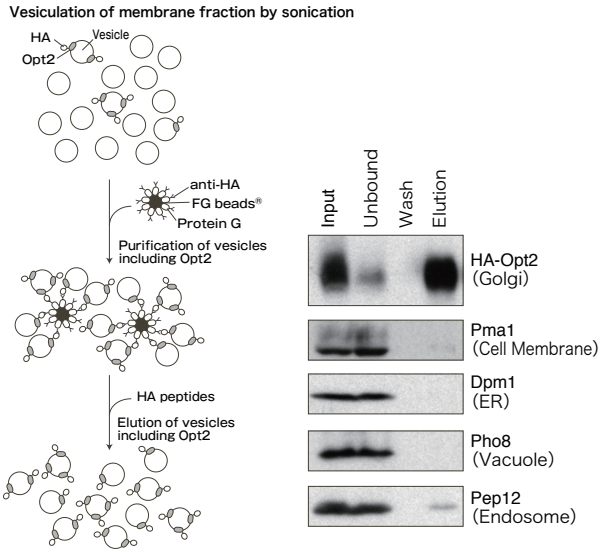


Indirect method

Antibodies were added to lysate first, then antibodies-antigens complex were separated by beads.



Immunoprecipitation of membrane protein

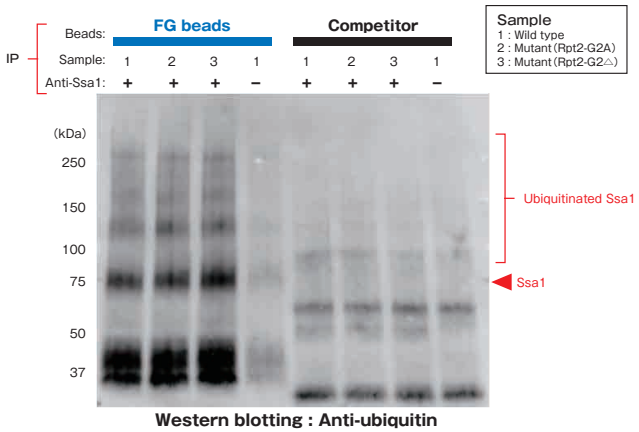


Purification and recovery by immunoprecipitation of Opt2 using by vesiculating the membrane

First, in order to collect Opt2 in a native conformation, we prepared vesicles including Opt2 by sonicating lysate. Next, using N-terminal HA tag of Opt2, we immunoprecipitated the vesicles including Opt2 by adding FG beads® (Protein G) and anti-HA tag antibodies. As a result of the western blotting, we confirm that there are a lot of Opt2 in the elution fraction. Furthermore, we evaluated other protein such as Pma1 to examine whether backgrounds of nonspecific vesicles exist in the elution fraction or not. As the result of the examination, we confirmed that none of the proteins exist in the elution fraction, and most of them exist in the unbound fraction. In FG beads®, nonspecific protein adsorption is scarcely found, and vesicles including Opt2 can be collected in a state of relatively high specificity.

S. Yamauchi et al., J. Cell Sci. 127 (2015) 61

Immunoprecipitation of ubiquitinated protein



Western blotting : Anti-ubiquitin

Analysis of ubiquitination of Ssa1 (chaperone proteins) with or without myristoylation of Rpt2 which is a subunit of proteasome

Immunoprecipitattion (IP) was perfomed by incubating S. cerevisiae lysate with Anti-Ssa1 antibody, and Antigen-Antibody complex was recovered with Protein G beads of each relevant maker. The complex was analyzed by western blotting by using Anti-ubiquitin antiboby. As a result of the western blotting, we were able to confirm that the ubiquitination of Ssa1 increased in the two types of mutants compared with the wild type. Furthermore, FG beads® enable recover a large amount of Ssa1 and ubiquitinated Ssa1, while competitor's beads do not enable to recover them.

A. kimura et al,. J. Proteomics 1(130) (2016) 33

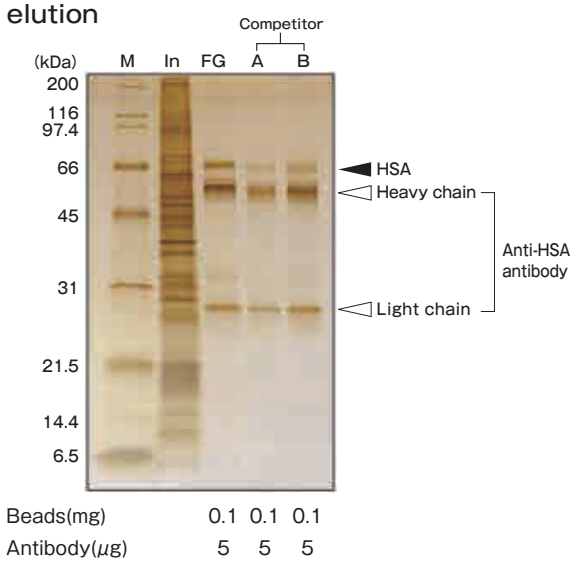
Comparison of antigen recovery amount with other magnetic beads

Using Protein G, which has strong affinity for many animal species and its subclasses, we show the characteristics of FG beads® as high recovery.

1. Experiment with the same amount of beads

0.1 mg of FG beads® have the capacity to bind antibody by 10 μg or more, and therefore can fully bind the antibody required for general immunoprecipitation.
We compared the recovery amounts of antigens for the beads (including FG beads®) of three companies, using 0.1 mg of the beads and 5 μg of anti-HSA.
The results show that FG beads® have the largest recovery amount.

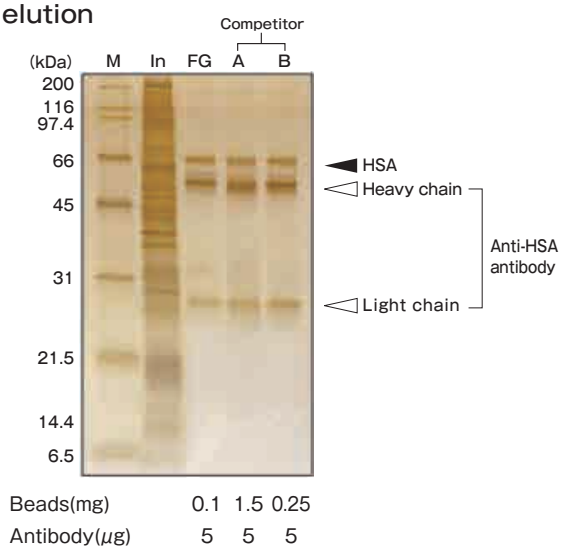
Boil elution



2. Experiment to obtain the same recovery amount of antigens

We performed immunoprecipitation to verify how much the beads of each company is required respectively to recover the same amount of antigens when 5 μg of anti-HSA is used.
The results show that the recovery amount of antigens for each company becomes the same under the conditions shown below.
It is, therefore, confirmed that the amount of FG beads® required for the immunoprecipitation is enough by 1/15 of that of competitor A and 1/2.5 of that of competitor B.

Boil elution



※The above experiments were performed based on protocols recommended by each company.

Immunoprecipitation related products

FG beads®

Product Number	Product Name	Ligand	Concentration	Quantity	Protocols for ligand immobilization
TAS8848N1110	Linker beads	Lysine residue	20mg/ml	5mg 20mg	【106】Immobilization of antibodies or proteins on Epoxy beads
TAS8848N1140	COOH beads	Lysine residue	20mg/ml	5mg 20mg	【101】Immobilization of antibodies or proteins on COOH beads
TAS8848N1141	NHS beads	Lysine residue	20mg/ml	5mg 10mg 20mg	【105】Immobilization of antibodies or proteins on NHS beads
TAS8848N1170	Streptavidin beads	Biotinylated IgG	20mg/ml	5mg 10mg 20mg	【108】Immobilization of biotinylated molecule on Streptavidin beads and NeutrAvidin™ beads
TAS8848N1171	NeutrAvidin™ beads	Biotinylated IgG	20mg/ml	5mg 10mg 20mg	【108】Immobilization of biotinylated molecule on Streptavidin beads and NeutrAvidin™ beads
TAS8848N1172	Protein A beads	IgG	20mg/ml	5mg 10mg 20mg	【110】Immobilization of antibodies on Protein A beads and Protein G beads
TAS8848N1173	Protein G beads	IgG	20mg/ml	5mg 10mg 20mg	【110】Immobilization of antibodies on Protein A beads and Protein G beads

★NeutrAvidin™ is a trademark of Thermo Fisher Scientific, Inc. and its subsidiaries.
★The protocol for Immunoprecipitation is【011】.

Buffer kit

Product Number	Product Name	Kit Contents	Quantity	Protocols
TAB1200N0320	IP Buffer Kit	・150 mM KCl buffer, PMSF(−) 3) ・0.1 M Glycine-HCl (pH2.5) ・1 M Tris-HCl (pH9.0)	75ml 1.5ml 0.1ml	【011】Immunoprecipitation
TAB1200N0310	Antibody immobilization Buffer Kit	・25 mM MES-NaOH(pH6.0) ・Protein immobilized beads Wash/storage buffer 4) ・1 M Aminoethanol(pH8.0)	3ml 45ml 15ml	【105】Immobilization of antibodies or proteins on NHS beads

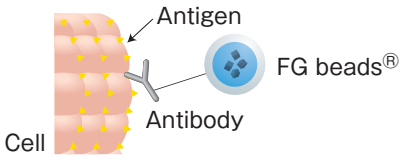
Buffer

Product Number	Product Name	Quantity	Use	Protocols
TAB1200N0321	150mM KCl buffer, PMSF(−) 3)	100ml	Immunoprecipitation binding/washing buffer	【011】Immunoprecipitation
TAB1200N0322	0.1M Glycine-HCl (pH2.5)	100ml	Immunoprecipitation acid elution buffer	
TAB1200N0323	1M Tris-HCl (pH9.0)	100ml	Immunoprecipitation neutralizing buffer	
TAB1200N0311	25mM MES-NaOH(pH6.0)	100ml	Antibodies immobilization buffer on NHS beads	【105】Immobilization of antibodies or proteins on NHS beads
TAB1200N0313	Protein immobilized beads Wash/storage buffer 4)	100ml	Immobilization of antibodies or proteins on NHS beads binding/washing buffer	
TAB1200N0314	1M Aminoethanol(pH8.0)	100ml	Immobilization of antibodies or proteins on NHS beads Masking buffer	

3) Composition 20 mM HEPES-NaOH(pH7.9), 150 mM KCl, 1 mM $MgCl_2$, 0.2 mM $CaCl_2$, 0.2 mM EDTA, 10%(w/v) glycerol, 0.1%(w/v) NP-40
☆When using, add PMSF so that the final concentration becomes 0.2 mM.
★Please use PMSF prepared at time of use.
4) Composition 10 mM HEPES-NaOH(pH7.9), 50 mM KCl, 1 mM EDTA, 10%(v/v) glycerol

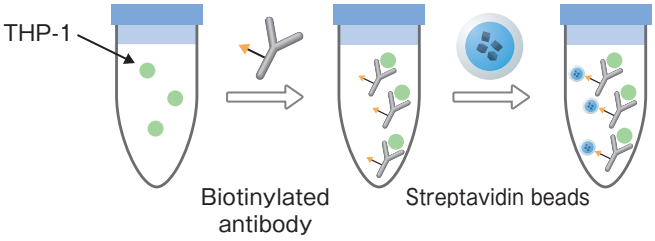
Cell separation

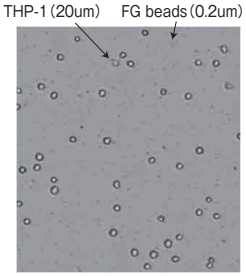
FG beads® don't require a large device by using cell surface antigen recognition antibody and it easily enable to recover cells in a short time by magnetic recovery. Both the direct method of immobilizing antibodies to FG beads® and adding them to cells, indirect method of adding beads after labeling the cells with antibodies first, are selectable.



Recovery of THP-1

A model experiment of cell separation using magnetic beads was performed using human monocytic cell, THP-1. We evaluated the cell separation ability of commercially available streptavidin-immobilized magnetic beads using the biotin-labeled THP-1. FG beads® have a higher recovery rate than other beads in our study.





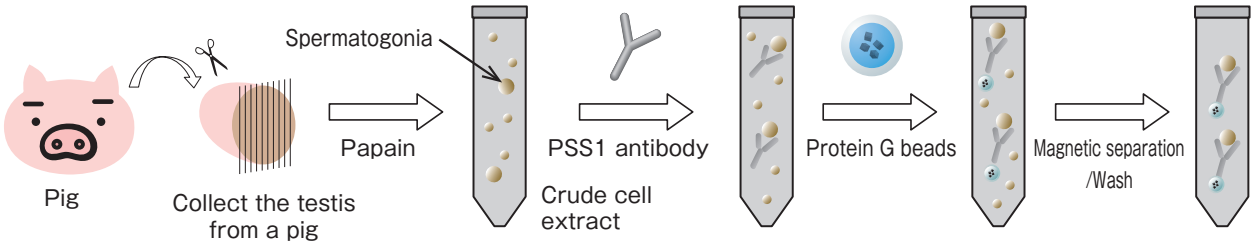
We compared FG beads® with competitor A and B by use of magnet stand.

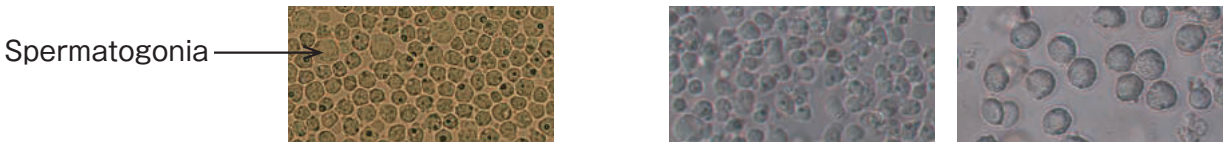
Beads	Collection rate (%)	Survival rate (%)	Survival rate (%) after 24h	Proliferation rate (%) after 24h
Non(untreated)	—	97	98	190
FG beads®	61.3	95	99	190
A	1.0	86	91	200
B	4.8	98	96	140

*Magnet Stand (cat#TA4899N12)

Recovery of spermatogonia

Several-days-old testicles were collected, cut into small pieces, and the seminiferous tubules were taken out with a mesh. The seminiferous tubules were digested in papain solution to make cell suspension. Cells were again passed through a mesh and PSS antibody was added to label the cells with antibodies. In addition, Protein G beads were added to cell suspension. Magnetic labelled cells were sorted by the 15 ml magnet stand for 3 times. As a result, spermatogonia that were about 3 to 4% before purification could be recovered with purity of 90% or more. An isolated system with a high recovery rate for a short time of cells could be constructed.





Cell separation related products

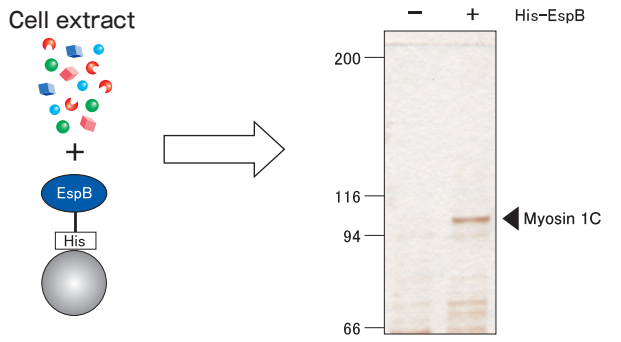
FG beads®

Product Number	Product Name	Ligand	Concentration	Quantity	Protocols for ligand immobilization
TAS8848N1110	Linker beads	Lysine residue	20mg/ml	5mg 20mg	【106】Immobilization of antibodies or proteins on Epoxy beads
TAS8848N1140	COOH beads	Lysine residue	20mg/ml	5mg 20mg	【101】Immobilization of antibodies or proteins on COOH beads
TAS8848N1141	NHS beads	Lysine residue	20mg/ml	5mg 10mg 20mg	【105】Immobilization of antibodies or proteins on NHS beads
TAS8848N1170	Streptavidin beads	Biotinylated IgG	20mg/ml	5mg 10mg 20mg	【108】Immobilization of biotinylated molecule on Streptavidin beads and NeutrAvidin™ beads
TAS8848N1171	NeutrAvidin™ beads	Biotinylated IgG	20mg/ml	5mg 10mg 20mg	【108】Immobilization of biotinylated molecule on Streptavidin beads and NeutrAvidin™ beads
TAS8848N1172	Protein A beads	IgG	20mg/ml	5mg 10mg 20mg	【110】Immobilization of antibodies on Protein A beads and Protein G beads
TAS8848N1173	Protein G beads	IgG	20mg/ml	5mg 10mg 20mg	【110】Immobilization of antibodies on Protein A beads and Protein G beads

★NeutrAvidin™ is a trademark of Thermo Fisher Scientific, Inc. and its subsidiaries.

Others

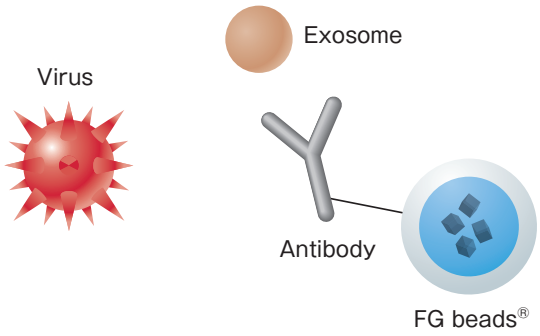
Protein-protein interaction



EspB is a protein of enterpathogenic E. coli (EPEC) essential for infection in humans. Myosin is isolated from human cell extract using EspB immobilized beads. As a result, the mechanism of EPEC infection was elucidated.

Y.Iizumi et al., Cell Host & Microbe.2 (2007) 383

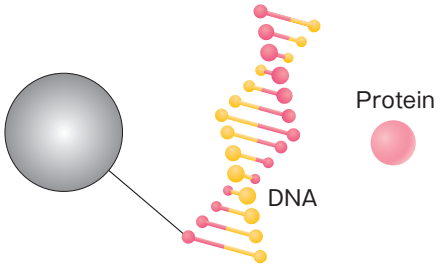
Isolation of virus and purification of exosome



Immobilize the antibody on the beads and purify the virus.

M.Arita et al., J Clin Microbiol. 53 (2015) 73 (※Viral isolation)

Purification of transcription factor



Immobilize DNA on the beads and purify the protein.

T.Imai et al., J. Colloid Interface Sci. 177(1996) 245

Phage display

Immobilize the target protein on the beads. And, screening was carried out using phage having peptides or proteins with specific interactions with the target protein.

M.Taki et al., Anal.Chem. 88(2016) 1096

Other uses related products

Product Number	Product Name	Ligand	Concentration	Quantity	Protocols for ligand immobilization
TAS8848N1010	Plain beads	Guanine(DNA)	20mg/ml	10mg 20mg	【301】Immobilization of double strand DNA on Plain beads
TAS8848N1110	Linker beads	Lysine residue	20mg/ml	5mg 20mg	【106】Immobilization of antibodies or proteins on Epoxy beads
TAS8848N1140	COOH beads	Lysine residue	20mg/ml	5mg 20mg	【101】Immobilization of antibodies or proteins on COOH beads
TAS8848N1141	NHS beads	Lysine residue	20mg/ml	5mg 10mg 20mg	【105】Immobilization of antibodies or proteins on NHS beads
TAS8848N1150	Ts beads	His-tag protein	20mg/ml	5mg 20mg	【102】Immobilization of His-Tag proteins on Ts beads
TAS8848N1170	Streptavidin beads	Biotinylated IgG	20mg/ml	5mg 10mg 20mg	【108】Immobilization of biotinylated molecule on Streptavidin beads and NeutrAvidin™ beads
TAS8848N1171	NeutrAvidin™ beads	Biotinylated IgG	20mg/ml	5mg 10mg 20mg	【108】Immobilization of biotinylated molecule on Streptavidin beads and NeutrAvidin™ beads
TAS8848N1172	Protein A beads	IgG	20mg/ml	5mg 10mg 20mg	【110】Immobilization of antibodies on Protein A beads and Protein G beads
TAS8848N1173	Protein G beads	IgG	20mg/ml	5mg 10mg 20mg	【110】Immobilization of antibodies on Protein A beads and Protein G beads

★NeutrAvidin™ is a trademark of Thermo Fisher Scientific, Inc. and its subsidiaries.

Buffer kit (for antibody or protein immobilization)

Product Number	Product Name	Kit Contents	Quantity	Protocol
TAB1200N0310	Antibody immobilization Buffer Kit	·25mM MES-NaOH (pH6.0) ·Protein immobilized beads Wash/storage buffer ·1M Aminoethanol (pH8.0)	3ml 45ml 15ml	【105】Immobilization of antibodies or proteins on NHS beads
TAB1200N0319	Protein immobilization Buffer Kit	·25mM HEPES-NaOH (pH7.0) ·Protein immobilized beads Wash/storage buffer ·1M Aminoethanol (pH8.0)	3ml 45ml 15ml	

Buffer (for antibody or protein immobilization)

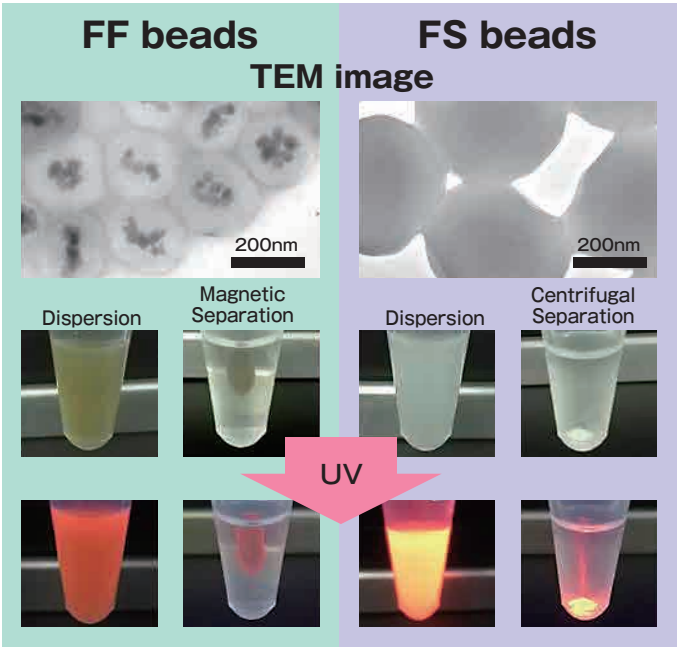
Product Number	Product Name	Quantity	Use	Protocol
TAB1200N0311	25mM MES-NaOH (pH6.0)	100ml	Antibodies immobilization buffer on NHS beads	【105】Immobilization of antibodies or proteins on NHS beads
TAB1200N0312	25mM HEPES-NaOH (pH7.0)	100ml	Proteins immobilization buffer on NHS beads	
TAB1200N0313	Protein immobilized beads Wash/storage buffer 1)	100ml	Immobilization of antibodies or proteins on NHS beads binding/washing buffer	
TAB1200N0314	1M Aminoethanol (pH8.0)	100ml	Immobilization of antibodies or proteins on NHS beads Masking buffer	

Fluorescent beads

FF beads/FS beads

FF beads are magnetically separable fluorescent beads, incorporating a fluorescent dye into conventional FG beads®. FS beads are nonmagnetic fluorescent beads. Fluorescent beads can be applied to various applications such as immunoassay, immunochromatography and immunohistostaining. In the following cases, please try FF beads and FS beads.

·Be dissatisfied with the fluorescent beads and enzyme method in use.
·Be considering a new system.

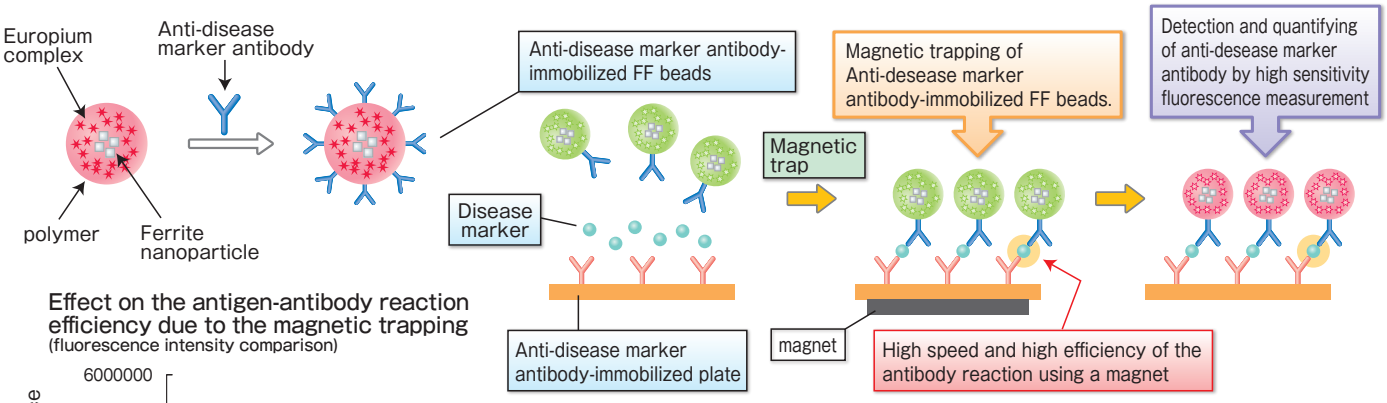


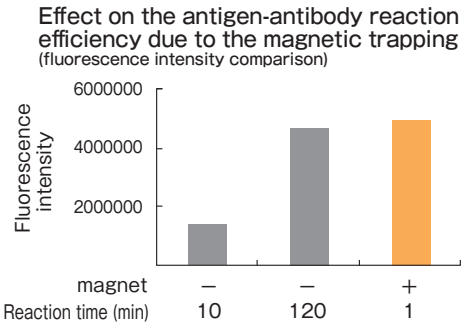
★Europium is used as a fluorescent dye.

Reference documents／
1) Sakamoto S, et al., Clinical Chemistry 60:4 (2014) 610
2) Terada K, et al., Int J Anal Bio-Sci Vol.2, No3 (2014) 101

Sandwich immunoassay using FF Eu beads

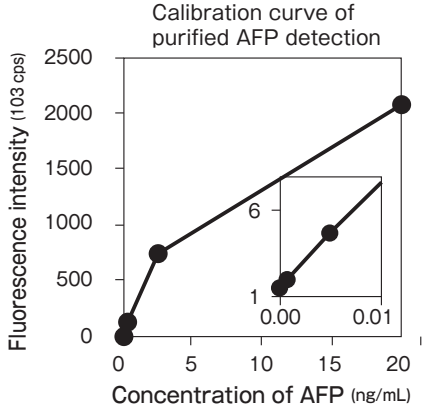
Application to immunoassay by antibody-immobilized FF beads. Because FF beads contain plenty of fluorescent dye, the detection sensitivity of them has become higher than that of the labelled antibodies of the conventional immunoassay. In addition, the reaction efficiency and the measuring speed have been improved by using a magnet for antigen-antibody reaction.

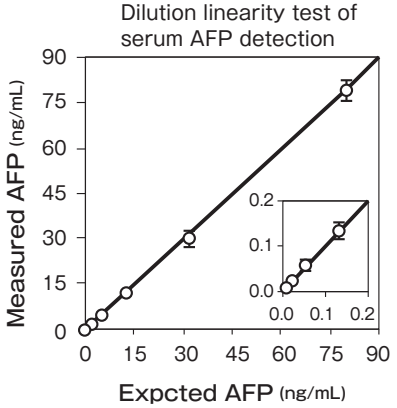




Faster reaction by using a magnet ⇒Get a strong signal in just 1 minute.

Detection result of the α-fetoprotein (tumor marker) in human serum





Measurement time and measurement sensitivity
(compared to the existing system)

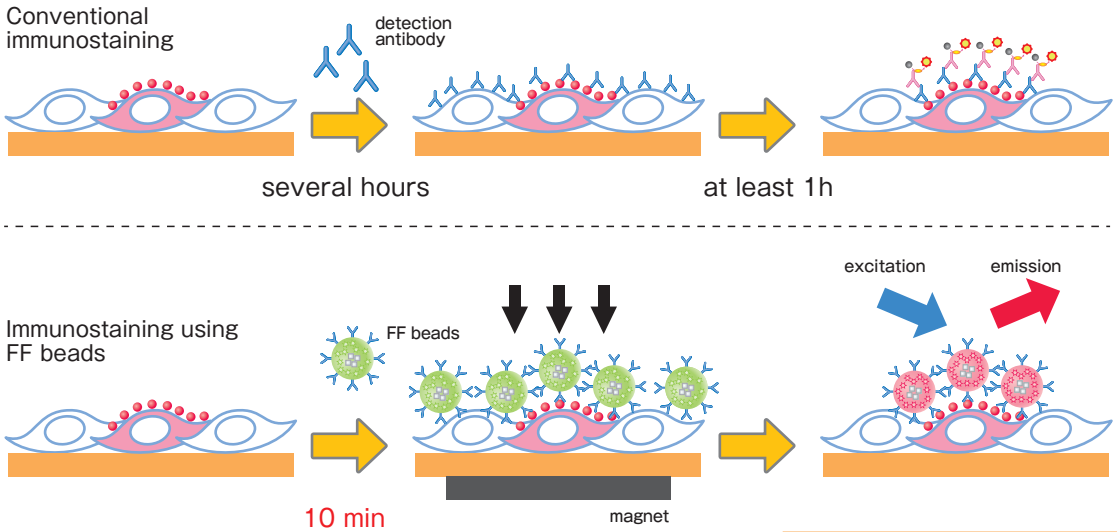
CV < 10%

	FF beads	CLEIA
Measurement time	8 min	30 min
Limit of Detection (LOD)	15 pg/ml	50 pg/ml
Limit of Quantitation (LOQ)	24 pg/ml	200 pg/ml

Reduction of measuring time and increase of sensitivity by FF beads

Immunostaining using FF Eu beads

When staining EGFR receptors in a xenograft specimen of A 431 human epidermoid carcinoma cell by using FF beads, the results of the conventional immunostaining was obtained in a short time.



HE staining

Paraffin-embedded

Immunogistochemical with FF beads

Rapid immunostaining is possible

Fluorescent beads Line-up

Product Number	Product Name	Fluorescent dye	Concentration	Magnetism	Diameter	Quantity
TAB8849N2140	FF Eu COOH beads	Eu Ex:340 nm Em:616 nm	10mg/ml	Magnetic	Approx. 0.2 μm	1mg 5mg 20mg
TAB8849N2170	FF Eu Streptavidin beads	Eu Ex:340 nm Em:616 nm	10mg/ml	Magnetic	Approx. 0.2 μm	1mg 5mg 10mg 20mg
TAB8849N2173	FF Eu Protein G beads	Eu Ex:340 nm Em:616 nm	10mg/ml	Magnetic	Approx. 0.2 μm	1mg 5mg 10mg 20mg
TAB8850N2140	FF Cyanine3 COOH beads	Cyanine3 Ex:550 nm Em:576 nm	10mg/ml	Magnetic	Approx. 0.2 μm	1mg 5mg 20mg
TAB8850N2170	FF Cyanine3 Streptavidin beads	Cyanine3 Ex:550 nm Em:576 nm	10mg/ml	Magnetic	Approx. 0.2 μm	1mg 5mg 10mg 20mg
TAB8851N2140	FF Cyanine5 COOH beads	Cyanine5 Ex:650 nm Em:684 nm	10mg/ml	Magnetic	Approx. 0.2 μm	1mg 5mg 20mg
TAB8851N2170	FF Cyanine5 Streptavidin beads	Cyanine5 Ex:650 nm Em:684 nm	10mg/ml	Magnetic	Approx. 0.2 μm	1mg 5mg 10mg 20mg
TAB5849N2140	FS Eu COOH beads	Eu Ex:340 nm Em:616 nm	10mg/ml	Nonmagnetic	Approx. 0.4 μm	1mg 5mg 20mg
TAB5849N2170	FS Eu Streptavidin beads	Eu Ex:340 nm Em:616 nm	10mg/ml	Nonmagnetic	Approx. 0.4 μm	1mg 5mg 10mg 20mg
TAB5849N2173	FS Eu Protein G beads	Eu Ex:340 nm Em:616 nm	10mg/ml	Nonmagnetic	Approx. 0.4 μm	1mg 5mg 10mg 20mg
TAB5850N2140	FS Cyanine3 COOH beads	Cyanine3 Ex:550 nm Em:576 nm	10mg/ml	Nonmagnetic	Approx. 0.4 μm	1mg 5mg 20mg
TAB5850N2170	FS Cyanine3 Streptavidin beads	Cyanine3 Ex:550 nm Em:576 nm	10mg/ml	Nonmagnetic	Approx. 0.4 μm	1mg 5mg 10mg 20mg
TAB5851N2140	FS Cyanine5 COOH beads	Cyanine5 Ex:650 nm Em:684 nm	10mg/ml	Nonmagnetic	Approx. 0.4 μm	1mg 5mg 20mg
TAB5851N2170	FS Cyanine5 Streptavidin beads	Cyanine5 Ex:650 nm Em:684 nm	10mg/ml	Nonmagnetic	Approx. 0.4 μm	1mg 5mg 10mg 20mg

Related products

Magnet Stand

Magnet stand is used for magnetic separation of the FG beads®.
Please choose the product in accordance with the operation to liquid volume.

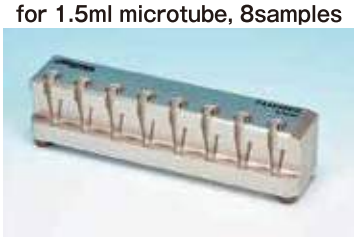
【Features】

·Capable of magnetic separation in a shorter time than the products of other companies.

·Capable of magnetic separation by cooling down samples to 4 ℃.

·Best suited for magnetic separation in a manual method of protein screening by use of the FG beads®.

for 1.5ml microtube, 8samples



TAB4899N12

for PCR tube, 16samples

TAB4899N41

for 15ml tube, 2samples

TAB4899N20

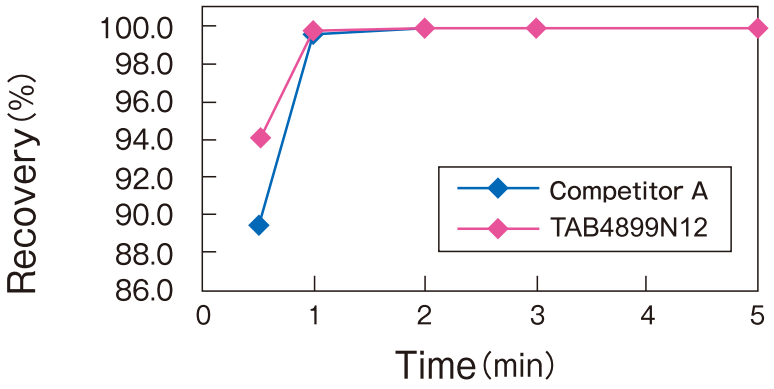
for 50ml tube, 2samples

TAB4899N30

Capable of magnetic separation in a short time

Shapes and placements of magnets are devised to efficiently separate magnetic nanoparticles. Shorter time for the separation than competitors' products leads toreduction of operation time.

Comparison of magnetic separation speed between **TAB4899N12** and competitor A.

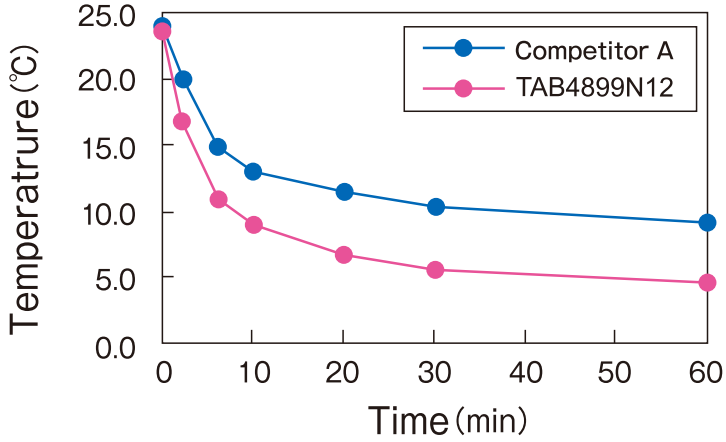


【Measurement condition】
Beads : Linker beads (TAS8848N1110)
Solution : 150 mM KCl buffer
Temperature : 24℃

Capable of magnetic separation at low temperature (4℃)

Because our magnetic stand is made of high thermal conductive aluminum alloy, solutions enable to be quickly cooled down to 4℃ by simply placing it on ice. So you can feel safe to conduct an experiment of a protein worried about its degeneration.

Comparison of cooling speed of solutions in micro-tubes between **TAB4899N12** and competitor A



Entrusted Services

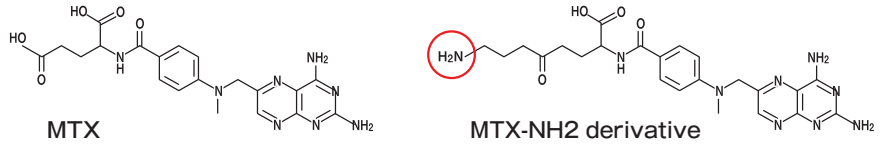
It is not just sales of magnetic beads!

We offer contracted analysis services for individual steps or all steps of chemical design, immobilization of ligands, affinity purification, and identification of target proteins.

Service Flow

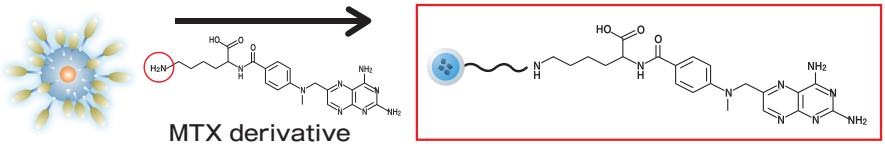
① Consult, design and synthesize the compound for the immobilization on certain FG beads®.

Based on the disclosure of strcture activity relationship (SAR) study with your compound, we will find the best way which FG beads® is suitable for your compound and whether your compound is necessary to modify/add extra functional group. If additional functional group is required, synthesize compound with additional functional group by yourself or by us.



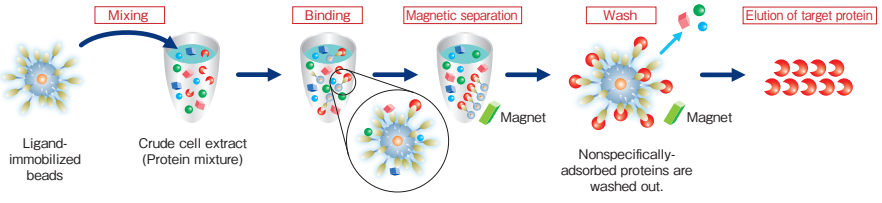
② Immobilize the compound on certain FG beads®.

Immobilize the compound on certain FG beads® and check the amount of compound by HPLC, actually immobilized on beads.



③ Affinity purification of binding protein(s)

Reaction immobilized beads with cell extracts provided by customer. Optimize of experimental condition.



④ Find specific target protein(s)

Isolate highly-specific band by competition and drug elution.

⑤ Identification of target protein(s)

Identify target protein(s) by Mass-Spectrometry. We help the analysis with thirdparty.

Antibodies, proteins, DNA and RNA can also be immobilized!

Application to cell separation is also possible!

FG beads® Website

Detailed information search related to products and download of protocols are also possible.

https://fgb.tamagawa-seiki.com/english/

FAQ

Q1. Are the sizes of FG beads® all equal?

The sizes are 0.2 μm. The CV value indicating variation is approximately 30%.

Q2. What is the linker length of FG beads®?

It is about 1 nm.

Q3. What is the number of particles per 1 mg of FG beads®?

It is about 1.8×10^{11} particles.

Q4. What is the approximate quantity of the functional groups on FG beads®?

The amount of epoxy on Plain beads is 1 μmol per 1 mg of beads. The amount of functional groups on COOH beads and NHS beads is 200 – 300 nmol per 1 mg of beads.

Q5. Are the FG beads® resistant to heat?

There are no problems up to approximately 70°C. However the type of beads having high functional reactivity of the linker end may come under an influence by the heat.

Q6. Are the FG beads® resistant to pH?

There are no problems within the range of pH2 - pH11. However the protein immobilized on beads may denature and the performance may decrease.

Q7. Is there the resistance to organic solvents of FG beads® in addition to DMF?

Ligands can be immobilized on the surfaces of FG beads® in various organic solvents, such as methanol, DMF, DMSO, THF, ethyl acetate, pyridine, dioxane, toluene, dichloromethane, chloroform, etc.

●K.Nishio et al., Colloids Surf. B:Biointerfaces 64 (2008)162

Q8. Can the FG beads® be reused?

It is believed that the beads can be reused when salt elution or drug elution was performed. However boil elution causes degeneration of the FG beads® and makes it impossible for them to be reused.

Q9. Can I quantify the immobilization amount of the antibodies on the beads?

It can be carried out by direct quantification of the immobilized antibodies. Please refer to Protocol 107 on our website.

Q10. Is there a way to increase antibodies immobilization efficiency?

There are several ways.

If binding is performed when 50 μg of antibodies is supplied to 1 mg of NHS beads, approximately 20 – 50 μg will be bound, although the result varies depending on the antibody animal, subclass, and clone. It is possible to increase the amount that is bound by increasing the amount on feed.

When streptavidin beads are used, up to approximately 10 μg of biotin-modified antibodies will bond to 1 mg of streptavidin beads, although this also varies depending on the antibody.

Q11. Can I disperse antibody-immobilized beads by ultrasonic device?

Please perform the dispersion of the beads by the manual agitation. When you cannot disperse the beads easily, disperse them in a short time by using an ice-cold ultrasonic homogenizer or ultrasonic washer. Please refer to the video on website for details.

Q12. When immobilizing antibodies to beads, the beads may adhere to the wall of the tube. Is there a way to suppress this?

It may be improved by stirring with a microtube mixer instead of inverting mixing. And please use a protein low bind tube.

Q13. How can I improve dispersibility of antibodies-immobilized beads?

Antibodies or proteins immobilized beads may easily precipitate. Please disperse the beads well before use. In addition, dispersibility improves if salt is removed from the buffer.

Q14. What is the optimal bead type for binding DNA?

Single-strand and double-strand DNA can be immmobilized to Plain beads.

Q15. What method is used to bind RNA?

Either bind synthesized RNA with a suitable functional group (amino group, SH radical, etc.) introduced onto the ends, or by binding DNA in advance and using hybridization to bind the RNA.

Technical Data

Protocols

<Chemical biology>

001 Screening by using ligand-immobilized beads
003 Immobilization of ligands (compounds with phenol groups or NH_2 groups) on epoxy beads
004 Immobilization of ligands (carboxylic compounds) on OH beads
005 Immobilization of ligands (carboxylic compounds) on NH_2 beads
008 Immobilization of ligands (compounds with NH_2 groups) on COOH beads
012 Competitive inhibition
013 Drug elution
014 Immobilization of ligands (compounds with NH_2 groups) on NHS beads
108 Immobilization of biotinylated molecule on Streptavidin beads and NeutrAvidin™ beads
109 Immobilization of ligands (alkyne structure compounds) on azide beads using click chemistry reaction
111 Immobilization of ligands (azido structure compounds) on azide beads using click chemistry reaction
201 Quantifying the amount of ligand immobilization by HPLC

※Ligand immobilization in chemical biology is 2.5 mg / condition in the above protocol.
Below is a small scale of 1 mg / condition.

003S Immobilization of ligands (compounds with phenol groups or NH_2 groups) on epoxy beads
004S Immobilization of ligands (carboxylic compounds) on OH beads
005S Immobilization of ligands (carboxylic compounds) on NH_2 beads
008S Immobilization of ligands (compounds with NH_2 groups) on COOH beads
014S Immobilization of ligands (compounds with NH_2 groups) on NHS beads
015S Immobilization of MTX derivatives on NHS beads

<Immunoprecipitation, Protein-protein interaction>

011 Immunoprecipitation by using antibody immobilized beads
101 Immobilization of antibodies or proteins on COOH beads
102 Immobilization of His-Tag proteins on Ts beads
105 Immobilization of antibodies or proteins on NHS beads
106 Immobilization of antibodies or proteins on Epoxy beads
107 Direct Quantification of Immobilized Proteins (Antibodies)
108 Immobilization of biotinylated molecule on Streptavidin beads and NeutrAvidin™ beads
110 Immobilization of antibodies on Protein A beads and Protein G beads

<Purification of DNA-binding protein>

001 Screening by using ligand-immobilized beads
301 Immobilization of double strand DNA on Plain beads

FG winds [Application Examples]

issue 1 Anticancer drug MTX target protein (Chemical Biology)
issue 2 THP-1(Cell separation)
issue 3 Kinase inhibitor BisindolylImaleimide (Chemical Biology)
issue 4 HDAC inhibitor Vorinostat (Chemical Biology)
issue 5 Comparison of antigen recovery volume with other magnetic beads (Immunoprecipitation)
issue 6 Intrinsic protein P16 (Immunoprecipitation)

Please see the website for more information

Line-up

Product Name	Product Number	Concentration	Capacity
FG beads® (P3~P8)			
Plain beads	TAS8848N1010	20mg/ml	10mg(0.5ml)
			20mg(1ml)
Linker beads	TAS8848N1110	20mg/ml	5mg(0.25ml)
			20mg(1ml)
OH beads	TAS8848N1120	20mg/ml	5mg(0.25ml)
			20mg(1ml)
NH_2 beads	TAS8848N1130	20mg/ml	5mg(0.25ml)
			20mg(1ml)
COOH beads	TAS8848N1140	20mg/ml	5mg(0.25ml)
			20mg(1ml)
NHS beads	TAS8848N1141	20mg/ml	5mg(0.25ml)
			10mg(0.5ml)
			20mg(1ml)
Ts beads	TAS8848N1150	20mg/ml	5mg(0.25ml)
			20mg(1ml)
Azide beads	TAS8848N1160	20mg/ml	5mg(0.25ml)
			10mg(0.5ml)
			20mg(1ml)
Alkyne beads	TAS8848N1161	20mg/ml	5mg(0.25ml)
			10mg(0.5ml)
			20mg(1ml)
Streptavidin beads	TAS8848N1170	20mg/ml	5mg(0.25ml)
			10mg(0.5ml)
			20mg(1ml)
NeutrAvidin™ beads	TAS8848N1171	20mg/ml	5mg(0.25ml)
			10mg(0.5ml)
			20mg(1ml)
Protein A beads	TAS8848N1172	20mg/ml	5mg(0.25ml)
			10mg(0.5ml)
			20mg(1ml)
Protein G beads	TAS8848N1173	20mg/ml	5mg(0.25ml)
			10mg(0.5ml)
			20mg(1ml)

NeutrAvidin™ is a trademark of Thermo Fisher Scientific, Inc. and its subsidiaries.

Fluorescent beads (P9~P10)			
■ FF beads(Magnetic, Diameter approx. 0.2 μm)			
FF Eu COOH beads	TAB8849N2140	10mg/ml	1mg(0.1ml)
			5mg(0.5ml)
			20mg(2ml)
FF Eu Streptavidin beads	TAB8849N2170	10mg/ml	1mg(0.1ml)
			5mg(0.5ml)
			10mg(1ml)
			20mg(2ml)
FF Eu Protein G beads	TAB8849N2173	10mg/ml	1mg(0.1ml)
			5mg(0.5ml)
			10mg(1ml)
			20mg(2ml)
FF Cyanine3 COOH beads	TAB8850N2140	10mg/ml	1mg(0.1ml)
			5mg(0.5ml)
			20mg(2ml)
FF Cyanine3 Streptavidin beads	TAB8850N2170	10mg/ml	1mg(0.1ml)
			5mg(0.5ml)
			10mg(1ml)
			20mg(2ml)
FF Cyanine5 COOH beads	TAB8851N2140	10mg/ml	1mg(0.1ml)
			5mg(0.5ml)
			20mg(2ml)
FF Cyanine5 Streptavidin beads	TAB8851N2170	10mg/ml	1mg(0.1ml)
			5mg(0.5ml)
			10mg(1ml)
			20mg(2ml)

Fluorescent beads (P9~P10)			
■ FS beads(Non Magnetic, Diameter approx. 0.4 μm)			
FS Eu COOH beads	TAB5849N2140	10mg/ml	1mg(0.1ml) 5mg(0.5ml) 20mg(2ml)
FS Eu Streptavidin beads	TAB5849N2170	10mg/ml	1mg(0.1ml) 5mg(0.5ml) 10mg(1ml) 20mg(2ml)
FS Eu Protein G beads	TAB5849N2173	10mg/ml	1mg(0.1ml) 5mg(0.5ml) 10mg(1ml) 20mg(2ml)
FS Cyanine3 COOH beads	TAB5850N2140	10mg/ml	1mg(0.1ml) 5mg(0.5ml) 20mg(2ml)
FS Cyanine3 Streptavidin beads	TAB5850N2170	10mg/ml	1mg(0.1ml) 5mg(0.5ml) 10mg(1ml) 20mg(2ml)
FS Cyanine5 COOH beads	TAB5851N2140	10mg/ml	1mg(0.1ml) 5mg(0.5ml) 20mg(2ml)
FS Cyanine5 Streptavidin beads	TAB5851N2170	10mg/ml	1mg(0.1ml) 5mg(0.5ml) 10mg(1ml) 20mg(2ml)

Product Name	Product Number
Magnet Stand (P11)	
for 1.5ml microtube, 8samples	TAB4899N12
for 15ml tube, 2samples	TAB4899N20
for 50ml tube, 2samples	TAB4899N30
for PCR tube, 16samples	TAB4899N41

Product Name	Product Number	Capacity
FG beads® Buffer/Buffer Kit		
25 mM MES-NaOH (pH6.0)	TAB1200N0311	100 ml
25 mM HEPES-NaOH (pH7.0)	TAB1200N0312	100 ml
Protein immobilized beads Wash/storage buffer	TAB1200N0313	100 ml
1 M Aminoethanol (pH8.0)	TAB1200N0314	100 ml
Antibody immobilization Buffer Kit	TAB1200N0310	50sets
Protein immobilization Buffer Kit	TAB1200N0319	50sets
150 mM KCl buffer, PMSF(−)	TAB1200N0321	100 ml
0.1 M Glycine-HCl (pH2.5)	TAB1200N0322	100 ml
1 M Tris-HCl (pH9.0)	TAB1200N0323	100 ml
IP Buffer Kit	TAB1200N0320	50sets
100 mM KCl buffer, DTT(−), PMSF(−)	TAB1200N0331	100 ml
1M KCl buffer , DTT(−), PMSF(−)	TAB1200N0332	100 ml
Screening Buffer Kit	TAB1200N0330	50sets
1 M HEPES-NaOH (pH7.9)	TAB1200N0911	50 ml
2.5 M KCl	TAB1200N0912	100 ml
1 M $MgCl_2$	TAB1200N0913	100 ml
1 M $CaCl_2$	TAB1200N0914	100 ml
10%(w/v) NP-40	TAB1200N0915	100 ml
MTX derivatives		
MTX derivatives	TAS8849N101	0.1mg

Entrusted Services (P12)
Design and synthesis of ligands
Immobilization of ligands to FG beads®
Purification and Identification of target proteins

TAMAGAWA SEIKI CO., LTD.

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