ThermoFisher SCIENTIFIC

DynaGreen magnetic beads

High-performing magnetic beads for immunoprecipitation, designed for sustainability

invitrogen

Choose high-performing magnetic beads without microplastics for immunoprecipitation

Immunoprecipitation (IP) with DynaGreen magnetic beads

Invitrogen™ DynaGreen™ magnetic beads are a highly magnetic, submicron bead platform with a pioneering sustainable design from manufacture to customer site.

Leading with Invitrogen™ DynaGreen™ Protein A, DynaGreen™ Protein A/G, and DynaGreen™ CaptureSelect™ Anti-IgG-Fc (Multi-species) beads, these 250 nm superparamagnetic beads enable high-performance direct and indirect IP of proteins, protein complexes, protein–nucleic acid complexes, and other antigens (Ag).

The magnetic separation technology used by DynaGreen magnetic beads is rapid and gentle, thereby causing minimal physical stress to your target proteins. The beads, consisting of a non-microplastic bead core and made with biosolvents, give reproducible results with low nonspecific binding and are perfectly suitable for downstream mass spectrometry and western workflows.

The submicron bead size increases the available target capture surface area, resulting in efficient isolation of target protein in less than 80 minutes in a simple bind-incubate-elute IP protocol that does not require preclearing.

DynaGreen magnetic beads can also facilitate automation of IP with any Thermo Scientific™ KingFisher™ instrument in a simple 40-minute protocol that greatly reduces hands-on time and manual errors.

Highlights:

- **High performance**, **yield**, and **purity** for direct and indirect immunoprecipitation
- **Sustainable** and holistic product design with **energy-efficient** manufacturing, **recyclable** packaging, and a **non-microplastic** magnetic bead core
- Backed by 30 years of **Invitrogen™ Dynabeads™ beads quality** and innovation
- **Automated workflow** on KingFisher systems

Designed as part of a comprehensive mass spectrometry workflow

Mass spectrometry (MS) is a powerful tool for identification, quantification, and characterization of proteins in complex biological samples. Sample preparation is one of the most important and time-consuming steps in the analysis of proteins by MS, and the quality and reproducibility of sample extraction and preparation significantly impact the results.

Thermo Fisher Scientific offers complete workflows for sample preparation and MS analysis of proteins (Figure 1). In the next section, we show that IP of both high- and low-abundance proteins can be achieved with DynaGreen magnetic beads and successfully used in an MS workflow.

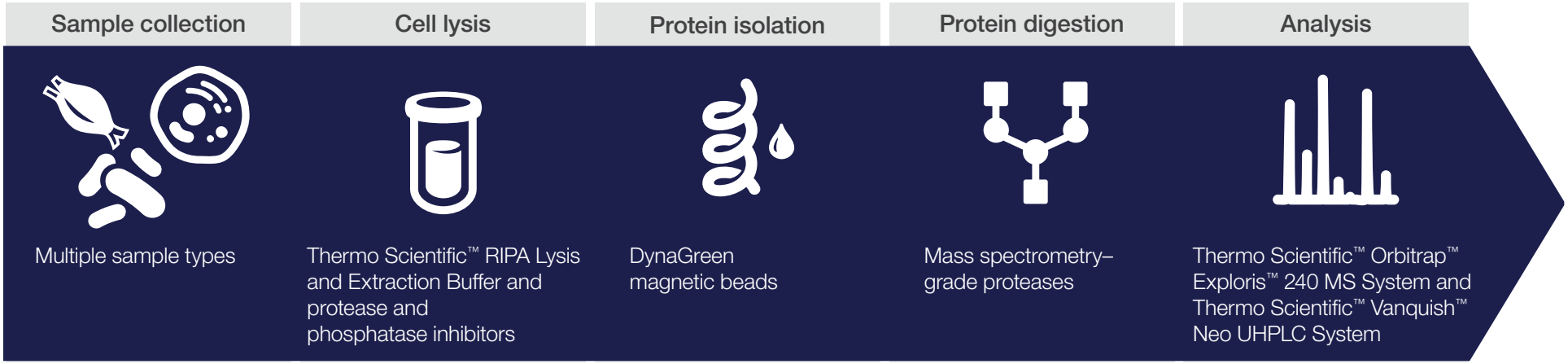


Figure 1. Mass spectrometry workflow.

High-performance protein enrichment for downstream mass spectrometry

Creating a highly pure protein sample with a high yield can be challenging. Protein enrichment, a technique used to concentrate target protein in a sample, is an essential step and is used when isolating low-abundance proteins or reducing the complexity of a sample for proteomic analysis.

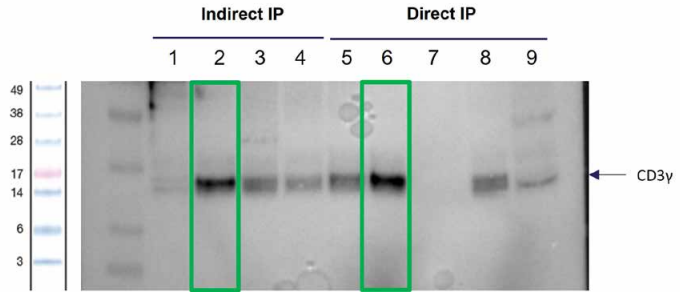
Enrichment can easily be done through both direct and indirect IP with DynaGreen magnetic beads. In Figures 2A and 2B, we show that high-quality pulldown of both high-abundance (CD3) and low-abundance (CD81) target protein is easily achieved with DynaGreen magnetic beads at comparable or better performance than today's standard. Furthermore, reproducibility data was gathered in-house through western blotting experiments of five replicates over three batches and shows excellent reproducibility for each of the magnetic beads (Figure 3A and 3B on following page).

To confirm our findings, we commissioned an ESI-LC/MS study at the proteomics core facility at the University of Oslo. Findings from these experiments show that target protein was detected in positive controls and not in negative controls. Reproducibility of data was confirmed across batches, as well as verification of reproducibility against a third-party control.

Detergents are hard to remove from solution and can, even at very low concentrations, interfere with downstream MS analysis. Contaminations can often be recognized by peak series with equal mass differences at the end of the LC-MS runs. No interfering levels from polymers or surfactants have been reported as part of the external study.

Benchmarking data—performance of DynaGreen magnetic beads against competitor magnetic beads.

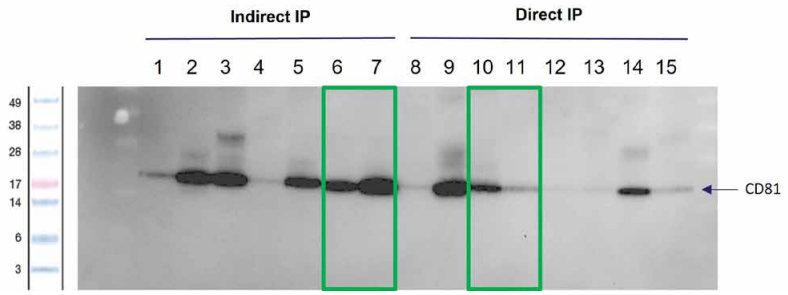
A



Western blot following either indirect or direct immunoprecipitation workflow to isolate CD3

1. Magne™ Protein A Beads (Promega)
2. DynaGreen Protein A beads (Thermo Fisher)
3. Protein A Mag Sepharose™ Xtra beads (Cytiva–Sigma)
4. Thermo Scientific™ Pierce™ Protein A Magnetic Beads (Thermo Fisher)
5. Invitrogen™ Dynabeads™ Protein A beads (Thermo Fisher)
6. DynaGreen Protein A beads (Thermo Fisher)
7. Blank—no sample
8. Protein A Mag Sepharose™(Cytiva–Sigma)
9. SureBeads™ Protein A Magnetic Beads (Bio-Rad)

B

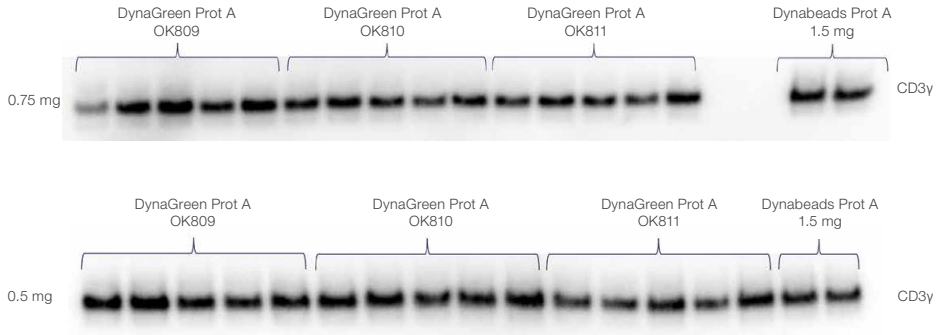


Western blot following either indirect or direct immunoprecipitation workflow to isolate CD81, a protein low in abundance

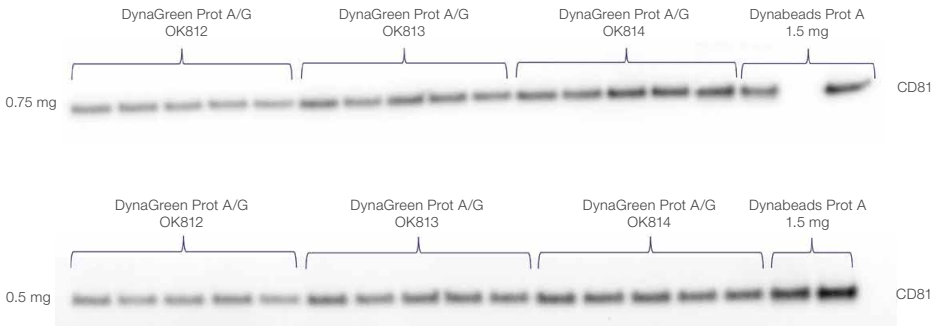
1. Sera-Mag™ SpeedBeads Protein A/G beads (Cytiva)
2. Thermo Scientific™ CaptureSelect™ IgG-Fc (Multi-species) Magnetic Agarose Beads (Thermo Fisher)
3. Protein G Mag Sepharose™ Xtra beads (Cytiva–Sigma)
4. Thermo Scientific™ Pierce™ Protein G beads (Thermo Fisher)
5. Thermo Scientific™ Pierce™ Protein A/G Magnetic Beads (Thermo Fisher)
6. DynaGreen CaptureSelect Anti-IgG-Fc (Multi-species) beads (Thermo Fisher)
7. DynaGreen Protein A/G beads (Thermo Fisher)
8. GenScript™ Protein A/G Mag Beads (GenScript)
9. Dynabeads Protein G beads (Thermo Fisher)
10. DynaGreen Protein A/G beads (Thermo Fisher)
11. DynaGreen CaptureSelect Anti-IgG-Fc (Multi-species) beads (Thermo Fisher)
12. PureProteome™ Protein A/G Mix Magnetic Beads (Millipore)
13. PureProteome™ Protein G Magnetic Bead System (Millipore)
14. Protein G Magnetic Sepharose™ beads (Cytiva–Sigma)
15. SureBeads™ Protein G Magnetic Beads (Bio-Rad)

Figure 2. Comparable or better performance with DynaGreen magnetic beads. Equal amounts of sample material with respect to Ab and cell lysate were used for all IP protocols according to the manufacturer's protocol. **(A)** We found that DynaGreen Protein A beads outperformed all competitors in both direct and indirect IP workflows. **(B)** DynaGreen Protein A/G beads outperformed all competitors in the indirect IP workflow. DynaGreen CaptureSelect Anti-IgG-Fc (Multi-species) beads gave the cleanest IP, while pulling down a comparable amount of target to Pierce Protein A/G magnetic beads (indirect workflow), Sera-Mag SpeedBeads Protein A/G Magnetic Beads, and SureBeads Protein G Magnetic Beads (direct workflow).

A DynaGreen Protein A reproducibility



B DynaGreen Protein A/G reproducibility



C DynaGreen CaptureSelect Anti-IgG-Fc reproducibility

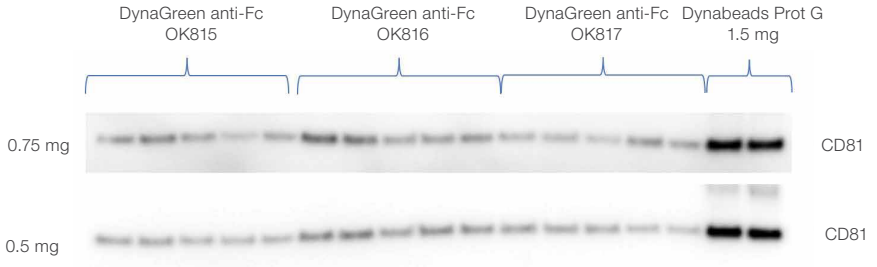


Figure 3. Excellent reproducibility of DynaGreen magnetic beads. Samples from five independent runs per particle amount, i.e., 0.75 and 0.5 mg each for DynaGreen Protein A **(A),** Protein A/G **(B),** and CaptureSelect Anti-IgG-Fc **(C)** beads, were analyzed. Two replicates of a Dynabeads Protein A/Protein G bead were used as controls. The same reagent batches were used and analyzed on the same gel and western blot. CD3γ: observed size 21–25 kDa. CD81: observed size ~26 kDa. The experiments found that at least three out of five parallel target bands appear with similar intensity, judged by visual inspection. All target bands appear with the same molecular weight as the control bead. The performance of the IPs was not affected by the amount of particles used.

	DynaGreen Protein A beads	DynaGreen Protein A/G beads	DynaGreen CaptureSelect Anti-IgG-Fc (Multi-species) beads
When to use	When using rabbit antibody, particularly if you want to pull down large amounts of protein.	When using mouse and rabbit antibodies, particularly when you want high yields of target protein. Suitable for all types of uses and is highly compatible with mass spectrometry.	When a high purity of sample is required, particularly for applications such as mass spectrometry. With secondary antibodies from multiple species.
Binding capacity	13–14 mg/mL	13–14 mg/mL	13–14 mg/mL
Size	250 nm	250 nm	250 nm
Yield	High	High	Medium
Nonspecific binding	Low	Low	Ultra-low
Quantity beads per IP	25 µL*	25 µL*	25 µL*
Protocols	Direct and indirect immunoprecipitation		
Mass spec compatible?	Yes		
Automation	Automation ready—protocols available for KingFisher purification systems		

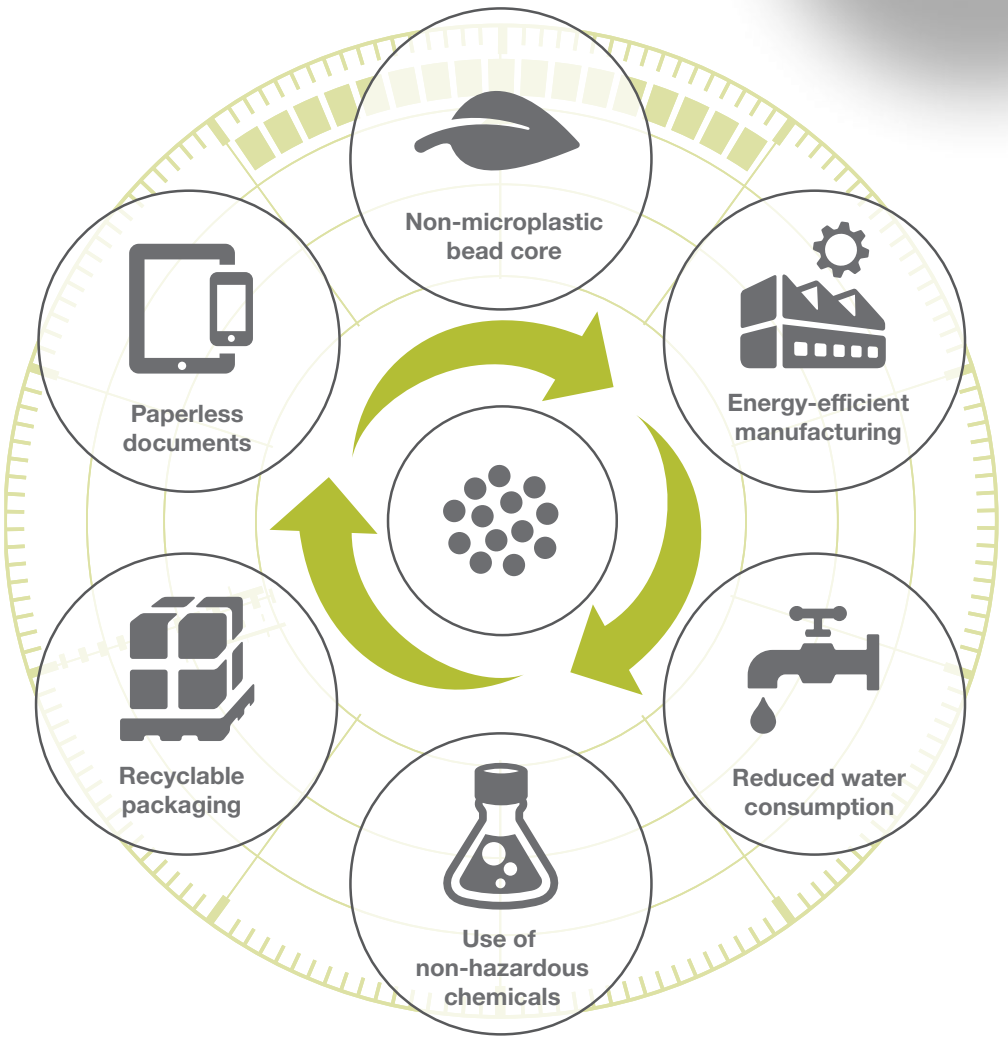
* High binding capacity means that a smaller volume of beads is required per IP. Competitors normally use 40–100 µL.

Designed for sustainability

DynaGreen magnetic beads sprung out from a concern about the proliferation and hazards of plastics in our environment and in response to a growing need for greener solutions without compromising on quality. These beads are designed with sustainability in mind from development to manufacturing and shipping. Twelve principles of green chemistry were applied at each development step, leading to a product that's good for your work and good for the environment.

Here is how we are doing our part:

- Non-microplastic bead design; beads consist solely of inorganic materials commonly found in nature (iron oxide and silica)
- The manufacturing process is extensively simplified to reduce manufacturing time, energy usage, and water consumption
- The chemicals used in producing the beads include more sustainable options such as biorenewable solvents, and all are absent from the EU REACH substances of very high concern (SVHC) list
- The beads are stored in a buffer containing greener and EHS-friendlier surfactant and biocide
- All mandatory documentation is digital (paperless), accessible via QR code
- To reduce shipping weight, no buffers are included; easy-to-prepare recipes using common lab chemicals are provided in the user guide
- All packaging is readily recyclable and efficient, and is paired with ambient shipping
- Transparency of sustainability features is available through ACT™ label certification



Automation

As the number of your experiments increases to medium-high throughput, your IP workflow can be easily scaled using DynaGreen magnetic beads and KingFisher automation purification systems.

The shape and features of DynaGreen magnetic beads make them ideally suited for automation protocols. The reason for this is that the beads disperse well, and their size makes them sediment slowly, keeping them suspended in solution longer in order to capture their target.

The automated protocols obtain equally high target protein yield and the same low nonspecific binding and high reproducibility as the manual protocol while greatly reducing hands-on time and turnaround time to 40 minutes. Simply push a button and walk away.

Ordering information

Description	Volume	No. of reactions	Cat. No.
DynaGreen Protein A beads	0.5 mL	20	80101G
	3 mL	120	80102G
	25 mL	1,000	80103G
DynaGreen Protein A/G beads	0.5 mL	20	80104G
	3 mL	120	80105G
	25 mL	1,000	80106G
DynaGreen CaptureSelect Anti-IgG-Fc (Multi-species) beads	0.5 mL	20	80107G
	3 mL	120	80108G
	25 mL	1,000	80109G
DynaMag-2 Magnet			12321D
KingFisher Apex sample prep system			5400910

Learn more at **thermofisher.com/dynagreen**

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