

PRODUCT DATA SHEET

NHS-Activated Gold Nanoparticle Conjugation Kit

Description

Cytodiagnosics NHS-activated Gold Nanoparticle Conjugation Kits have been optimized for high efficiency one-step conjugations of proteins and other primary amine-containing ligands to gold nanoparticles with diameters in the size range of 5nm-100nm.

The kit contains ready-to-use pre-made mixtures. No activation or manipulation of the gold nanoparticles is required prior to conjugation, which often results in poor performing conjugates. Simply mix your protein with the pre-activated NHS ester gold nanoparticles supplied in the kit.

Kits are available in convenient 3 or 10 small-scale reactions formats allowing multiple to be conjugated simultaneously and ready for use in 2.5 hours or less. These kits are ideal for screening and optimization purposes prior to scale-up production. Scale up can be performed with our NHS-Activated Gold Nanoparticle Conjugation MIDI kits.

Features & Benefits

- Results in covalently bound ligand and more stable conjugate.
- Fast and convenient one-step conjugation reaction with no pre-activation requirements
- Spacer between the gold nanoparticle surface and conjugated ligand minimizes effects on the tertiary protein structure, which can lead to poor performing conjugates, which is a common problem seen in conjugates prepared by passive adsorption.

Applications

- Ideal for development of protein gold conjugates for use in applications such as blotting, lateral flow assays, microscopy and transmission electron microscopy (TEM).

Kit Components

- NHS-Activated Gold Nanoparticles (lyophilized)
- Protein Re-suspension Buffer
- Reaction Buffer
- Quencher Solution

NHS-Activated Gold Nanoparticle Specifications

Gold surface: NHS-ester (spacer between gold surface and NHS-group)

Core diameter: Available with diameters from 5nm-100nm

Optical density (OD): OD=20 when the contents of each vial is dissolved to a final volume of 100ul (1ml for MIDI Kit).

Particles per ml: Core size dependant, please see table II.

Lambda max: Core size dependant, please see table II.
Supplied in ready to use lyophilized format

Storage

All components of this kit should be stored at -20°C. If stored unopened and as specified, Cytodiagnosics NHS-activated gold nanoparticles are stable for at least 3 months.

Product Safety and Handling

This product is for R&D use only, not for drug, household, or other uses. Please review the material safety datasheet (MSDS) available online for proper safety and handling procedures.

Factors to Consider Prior to Conjugation

The protein/antibody or other ligand to be conjugated needs to be in a purified form, and proper care must be taken to ensure that the ligand stock is devoid of the following for proper functionality:

- No additional protein additives such as BSA
- Avoid free amino acids (e.g. glycine)
- Avoid common thiol additives such as DTT, TCEP and mercaptoethanol
- Avoid EDTA
- Avoid primary amine containing buffers or components (e.g. Tris)
- Avoid use of strong buffers that might change the pH of the conjugation reaction. See paragraph below for recommended buffers for optimal performance of the kit.

If your protein/antibody stock contains any of the above, dialyse or use a desalting column to transfer your ligand into a compatible buffer such as sodium phosphate, MES, MOPS or HEPES. If contaminating proteins such as BSA is present, the protein needs to be purified prior to conjugation.

Conjugation Protocol

A recommended starting protocol for conjugation can be found below. Note that the amount of protein added may need to be optimized for your particular protein.

1. Allow all reagents to warm to room temperature before use.
2. Using the supplied protein re-suspension buffer, dilute or dissolve your protein/antibody to the final concentration suitable for the particular gold nanoparticle size to be conjugated as indicated in table II (page 3).

Note: For effective conjugation, the purity of the protein needs to be considered. Any other molecules containing primary amines (e.g. TRIS) or other contaminating proteins (e.g. BSA) may compete with the protein to be conjugated and hence severely reduce the conjugation efficiency and should therefore be avoided. Consider using BSA Removal Kit for Nanoparticle Conjugation (SR-08-01).

3. In a microcentrifuge tube combine your diluted protein sample with reaction buffer according to the table below.

	3 or 10 Small Scale Reaction Format Kits	Midi Kits
Reaction Buffer	60µl	600µl
Diluted Protein Solution	48µl	480µl
Total Volume	108µl	1080µl

4. Transfer 90µl (900µl for the Midi Kit) of your protein/reaction buffer mix prepared in step 3 to one of the vials containing lyophilized NHS-activated gold nanoparticles and immediately mix well by pipetting up and down.

Note: Do not resuspend the lyophilized NHS-activated gold nanoparticles in buffer prior to addition of protein. NHS rapidly hydrolyzes in aqueous solution and may result in loss of conjugation efficiency.

5. Incubate the vial at room temperature for at least 2 hours.
6. Add 10µl (100µl for Midi Kit) of quencher solution to the vial and incubate for 5 minutes to stop the reaction.
7. (Optional Step) - Add 10µl (100µl for Midi Kit) of 10% bovine serum albumin (BSA) to the vial and incubate for 5 minutes to block.

8. Using a microcentrifuge, centrifuge the vial for 30 minutes using the appropriate speed for the gold nanoparticle size you are using according to table I.
9. Discard the supernatant containing unbound protein.
10. Add 1mL of gold conjugate storage buffer to the vial to re-suspend your conjugate.
11. Repeat step 8-9 to wash away additional unbound protein.
12. Add 100µl (1mL for Midi Kit) of gold conjugate storage buffer to the vial to re-suspend your conjugate. Brief sonication might be required to fully redisperse the conjugate.

*** Note:** A gold conjugate storage buffer is not supplied with the kit. Use a standard biological buffer compatible with your protein.

A recommended storage buffer for an antibody gold conjugate is 20mM Tris (pH 8.0), 150mM NaCl supplemented with 1% (w/v) BSA and 0.025% Tween 20.

13. Obtain a UV-VIS spectra of the conjugate using a spectrophotometer and dilute to an optical density of 10 using gold conjugate storage buffer.
14. Store your protein conjugate at 4°C until use.
15. (Optional Step) - Perform a conjugation quality control test to ensure a successful conjugation reaction using our Conjugation QC Lateral Flow Dipstick Kit (Cat. # LF-018-10).

Your conjugate is now ready for use!

Table I. Recommended centrifugation force by gold nanoparticle size.

Gold Nanoparticle Diameter	Centrifugation Force
5nm	100kDa MWCO Spin Column
10nm	17,000 x g, 1hr or 100kDa MWCO Spin Column
15nm	17,000 x g
20nm	10,000 x g
30nm	2,500 x g
40nm	1,400 x g
50nm	1,100 x g
60nm	900 x g
70nm	700 x g
80nm	600 x g
90nm	500 x g
100nm	400 x g

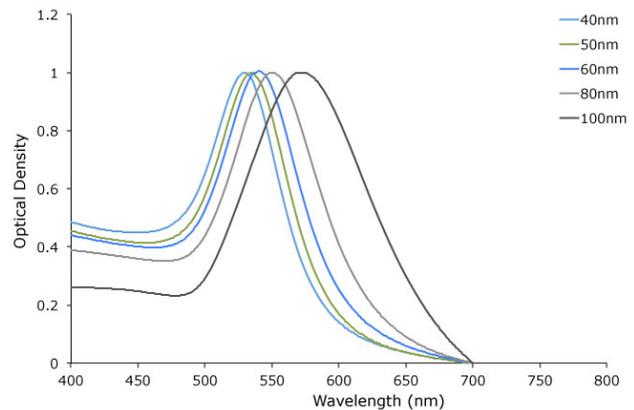
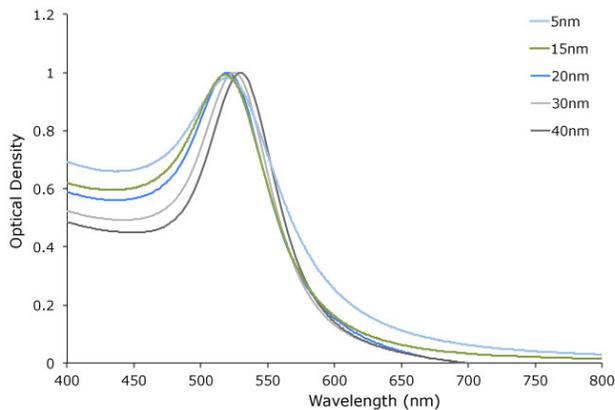


Table II. Suggested protein concentrations to be used for step 2 in the conjugation protocol above based on the gold nanoparticle size to be conjugated. Note that the concentrations in the table below are optimized for an antibody with a molecular weight of 150kDa. For proteins differing significantly in molecular weights the amounts indicated might need to be optimized for optimal performance.

Gold Nanoparticle Diameter	Suggested Protein Concentration
5nm	5 mg/ml
10nm	3 mg/ml
15nm	2 mg/ml
20nm	1 mg/ml
30nm	1 mg/ml
40nm	0.5 mg/ml
50nm	0.5 mg/ml
60nm	0.5 mg/ml
70nm	0.5 mg/ml
80nm	0.5 mg/ml
90nm	0.5 mg/ml
100nm	0.5 mg/ml

Table III. Gold nanoparticle specifications by size. Please note that all values below are indicated at an optical density of 1 (OD/cm¹) at their respective lambda max. At other optical densities the values needs to be adjusted (e.g. NPS/ml (@OD2) = 2 x NPS/ml (@OD1)).

Diameter (nm)	Peak SPR Wavelength (nm)	NPS/ml	Wt. Conc. (mg/ml)	Molar Ext (M ⁻¹ cm ⁻¹)	Size Dispersity (+/-nm)	Particle Volume (nm ³)	Surface Area (nm ²)	Surface/Volume Ratio	Particle Mass (g)	Molar Mass (g/mol)	Molar Conc.
5	515-520	5.47E+13	6.94E-02	1.10E+07	<15%	6.54E+01	7.85E+01	1.2	1.27E-18	7.64E+05	9.08E-08
10	515-520	5.98E+12	6.07E-02	1.01E+08	<15%	5.24E+02	3.14E+02	0.6	1.02E-17	6.11E+06	9.93E-09
15	520	1.64E+12	5.61E-02	3.67E+08	<12%	1.77E+03	7.07E+02	0.4	3.43E-17	2.06E+07	2.72E-09
20	524	6.54E+11	5.31E-02	9.21E+08	<12%	4.19E+03	1.26E+03	0.3	8.12E-17	4.89E+07	1.09E-09
30	526	1.79E+11	4.91E-02	3.36E+09	<12%	1.41E+04	2.83E+03	0.2	2.74E-16	1.65E+08	2.98E-10
40	530	7.15E+10	4.65E-02	8.42E+09	<12%	3.35E+04	5.03E+03	0.15	6.50E-16	3.91E+08	1.19E-10
50	535	3.51E+10	4.45E-02	1.72E+10	<10%	6.54E+04	7.85E+03	0.12	1.27E-15	7.64E+08	5.83E-11
60	540	1.96E+10	4.30E-02	3.07E+10	<10%	1.13E+05	1.13E+04	0.1	2.19E-15	1.32E+09	3.25E-11
70	548	1.20E+10	4.17E-02	5.03E+10	<10%	1.80E+05	1.54E+04	0.086	3.48E-15	2.10E+09	1.99E-11
80	553	7.82E+09	4.06E-02	7.70E+10	<10%	2.68E+05	2.01E+04	0.075	5.20E-15	3.13E+09	1.30E-11
90	564	5.37E+09	3.97E-02	1.12E+11	<8%	3.82E+05	2.54E+04	0.067	7.40E-15	4.46E+09	8.92E-12
100	572	3.84E+09	3.89E-02	1.57E+11	<8%	5.24E+05	3.14E+04	0.06	1.02E-14	6.11E+09	6.37E-12



Catalogue Number	Description	Sizes
CGN5K-5-X*	5nm NHS-Activated Gold Nanoparticles Conjugation Kit	3 reactions, 10 reactions, MIDI Kit
CGN5K-10-X*	10nm NHS-Activated Gold Nanoparticles Conjugation Kit	3 reactions, 10 reactions, MIDI Kit
CGN5K-15-X*	15nm NHS-Activated Gold Nanoparticles Conjugation Kit	3 reactions, 10 reactions, MIDI Kit
CGN5K-20-X*	20nm NHS-Activated Gold Nanoparticles Conjugation Kit	3 reactions, 10 reactions, MIDI Kit
CGN5K-30-X*	30nm NHS-Activated Gold Nanoparticles Conjugation Kit	3 reactions, 10 reactions, MIDI Kit
CGN5K-40-X*	40nm NHS-Activated Gold Nanoparticles Conjugation Kit	3 reactions, 10 reactions, MIDI Kit
CGN10K-50-X*	50nm NHS-Activated Gold Nanoparticles Conjugation Kit	3 reactions, 10 reactions, MIDI Kit
CGN10K-60-X*	60nm NHS-Activated Gold Nanoparticles Conjugation Kit	3 reactions, 10 reactions, MIDI Kit
CGN10K-70-X*	70nm NHS-Activated Gold Nanoparticles Conjugation Kit	3 reactions, 10 reactions, MIDI Kit
CGN10K-80-X*	80nm NHS-Activated Gold Nanoparticles Conjugation Kit	3 reactions, 10 reactions, MIDI Kit
CGN10K-90-X*	90nm NHS-Activated Gold Nanoparticles Conjugation Kit	3 reactions, 10 reactions, MIDI Kit
CGN10K-100-X*	100nm NHS-Activated Gold Nanoparticles Conjugation Kit	3 reactions, 10 reactions, MIDI Kit

*X Indicates quantity, i.e. -1 for a 3-reaction kit, -2 for a 10-reaction kit and -3 for a MIDI kit.
 For custom sizes and information on bulk quantities and prices please contact our customer service department.

Ordering Information

For ordering call 866-344-3954 or visit us online at www.cytodiagnosics.com



919 Fraser Drive Unit 11, Burlington, ON, L7L 4X8, Canada
 Tel: 866-344-3954 Fax: 289-204-9100
www.cytodiagnosics.com