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Specializes in R&D and manufacturing of peptide synthesis equipment, providing comprehensive technical solutions and services.

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Development of Precise Peptide Oligomeric Tags for Mass Cytometry

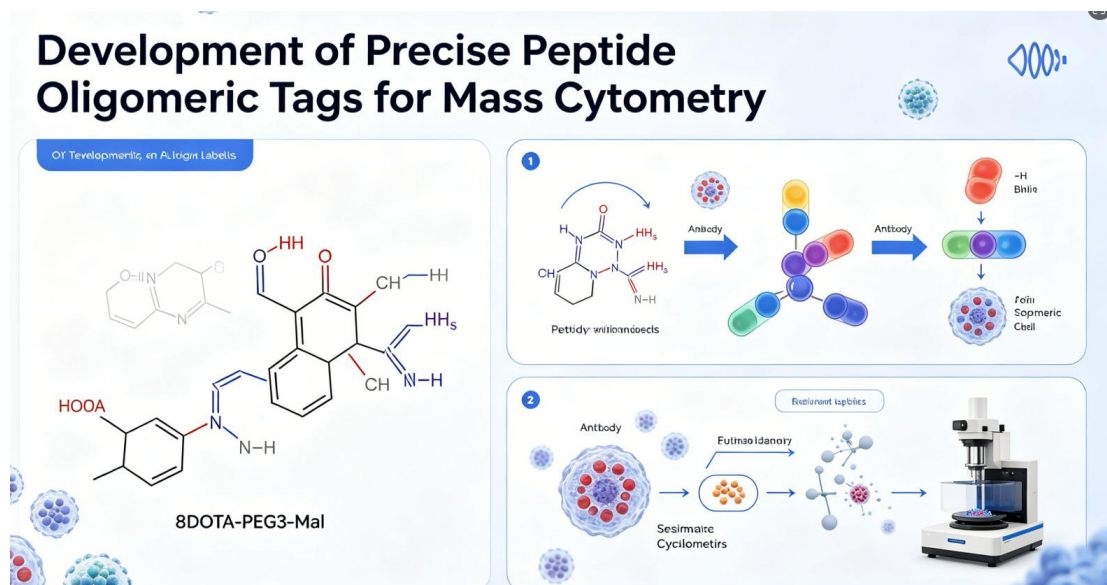
1.The Research Background

Mass cytometry breaks through the spectral interference limitation of traditional fluorescence flow cytometry and supports over one hundred single-cell multi-index detection, relying heavily on high-performance metal labeling tags. Commercially available polymer and nanoparticle tags suffer from broad molecular weight distribution, uneven metal loading, large steric hindrance and unstable labeling effect, which restrict detection accuracy and repeatability. To fix these defects, researchers adopt solid-phase peptide synthesis to develop structurally defined peptide-based mass tags for mass cytometry application.

2.Research Purpose and Significance

This research aims to design and synthesize 8DOTA-PEG3-Mal oligopeptide tag with accurate molecular structure, solve the drawbacks of existing commercial labels, realize high-uniform, high-efficiency antibody coupling. The new tag simplifies preparation and marking procedures, improves detection specificity and stability, provides a new technical

platform for high-parameter single-cell analysis and lays a foundation for industrialized production of mass cytometry labeling reagents.



3. Research Content

The team uses controllable Fmoc solid-phase peptide synthesis and iterative block coupling technology to build the target tag. The modular structure contains DOTA metal chelating units, PEG hydrophilic linker and terminal maleimide active group, featuring low steric hindrance. Experimental results prove the tag can directly connect antibody free sulfhydryl without antibody pre-modification; each IgG heavy chain binds 2 tags and light chain binds 1 tag, carrying total 48 metal ions averagely. Cell testing on Jurkat/HeLa model shows labeled antibody owns outstanding specificity and signal sensitivity. In human peripheral blood mononuclear cell typing experiment, the new tag achieves identical cell classification results as commercial Maxpar X8 reagent, and antibody conjugates keep stable detection signals after 120 days storage at 4 °C

without obvious attenuation.

4. Conclusion & Outlook

The self-developed 8DOTA-PEG3-Mal peptide tag overcomes multiple disadvantages of conventional labeling materials with precise structure, low steric hindrance, excellent metal chelating capacity and superior storage stability, matching mainstream commercial reagent performance in multi-parameter cell detection. In future, researchers will further optimize tag molecular framework, enrich different chelator combinations to build diversified tag libraries, expand application in spectral mass cytometry and high-dimensional single-cell omics detection, accelerate industrial transformation of this peptide labeling material.