Technology Available for License: Novel Dyes for Proteomic Research, Drug Development and Diagnostics

Background: Proteins and modified proteins that control biological mechanisms are often present in low concentrations and are not detected by existing proteomic technology. In order to maintain health and to diagnose and cure disease it is extremely valuable to understand the underlying biological mechanisms Such understanding requires detection and measurement of the protein forms that control these processes.

Finding: To this end, researchers at Montana State University have developed optical labeling molecules – dyes - that possess increased detection sensitivity. These water-soluble Zwitterionic dyes also enable recovery of intact proteins and allow for versatile, high speed, multiplex analysis for proteomics. With the use of these dyes, intact proteins of interest that show changes in amount or changes in enzyme activity can be more effectively selected and isolated for analysis of protein identity and posttranslational protein modifications. Further, these optical labeling molecules can be removed after separation and before identification and analysis by mass spectral methods.

The principal use of the dyes is to find protein differences in complex protein mixtures that reveal biological mechanisms, which lead to drug discovery or design of new diagnostics.

Technical: The invention represents a new generation of covalently linked fluorescent differential protein detection dyes. The dyes contain Zwitterionic groups, which are pairs of fixed positive and negative charges that greatly enhance water solubility and are chosen to maintain their paired charges and net electrical neutrality over a very wide range of pH. The charged, Zwitterionic groups on the dyes preserve protein solubility during labeling of proteins with dye groups, permitting heavier labeling without perturbing the protein acid/base balance (isoelectric point). Data suggest that these dyes can detect 10 – 15% more proteins than the leading industry dyes.

Benefits in research, drug development and diagnostics:

1. Increased sensitivity for intact protein detection
2. Improved quantification of differential protein levels and identification of changes in post-translational modification
3. Improved protein recovery
4. Activity across broad pH range
5. Reversible protein amine labeling
6. Multi-color, multiplex capability
7. Can be used for s-nitrosothiol (SNO) trapping
8. Compatible with labeling, gel separation & imaging protocols used in 2D-DIGE experiments

This discovery was made by Dr. Edward Dratz, and Dr. Paul Grieco in the Department of Chemistry and Biochemistry at Montana State University

Intellectual Property Status: US 8,197,759; 8,197,758; 7,833,799; Canada and EU pending.

Publications using this technology:

1. Proteomic analysis of Sulfolobus solfataricus during Sulfolobus Turreted Icosahedral Virus infection. http://www.ncbi.nlm.nih.gov/pubmed/22217245
2. Proteomic and Systems Biology Analysis of Monocytes Exposed to Securinine, a GABAA Receptor Antagonist and Immune Adjuvant
   http://www.plosone.org/article/info:doi/10.1371/journal.pone.0041278

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