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Protein Oxidation as a Metric of Blood Sample Integrity

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Invention Description

Human blood plasma and serum (P/S) samples from clinical studies are often archived by biobanks for future research. Biospecimen integrity is crucial for ensuring the validity of clinically oriented research. P/S samples are not intrinsically stable. Inappropriate handling and storage conditions can result in protein oxidation, which can dramatically impact protein measurements and potentially render results inaccurate and unusable. A clear need exists for quality control tools for retrospective assessment of biobanked sample integrity. Although there are some biomarkers used for assessment of sample integrity, they are based on quantitative loss of a particular target protein and none are widely implemented or accepted as a gold standard.

Researchers at the Biodesign Institute of Arizona State University have developed qualitative and quantitative means by which to assess the molecular integrity of biobanked or otherwise archived P/S samples following pre-analytical sample handling, processing, or storage. Very little sample is needed for the assessment and it is sensitive enough to robustly detect molecular changes that occur within hours at room temperature or two days at -20 ^{o}C. Moreover, two different types of biomolecular alteration caused by improper P/S sample storage can be detected simultaneously.

This technology provides a mechanism-based measurement of qualitative changes that occur within proteins due to oxidation and allows for one to directly see/detect the actual molecular damage to proteins that has occurred in a sample.

Potential Applications

- Retrospective assessment of the integrity of archived P/S samples by measuring protein oxidation
    - Biobanks
    - Individual investigators

Benefits and Advantages

- Direct, mechanism-based measurements of molecular damage in archived P/S samples
- Sensitive enough to accurately detect molecular changes that take place within hours at room temperature or two days at -20 ^{o}C
- Only 0.5 µL of P/S is needed for detection – doesn't significantly deplete specimen volume
- A single assay captures information from both a short term and a long term impact marker of oxidative P/S specimen integrity
- The markers are not elevated by patient disease state