**In Vitro** Stability of a Monoclonal Antibody, Adalimumab, after DosePro Instantaneous Delivery

*In vitro* characterization of the stability of a therapeutic monoclonal antibody demonstrates equivalence between instantaneous delivery (<1/10th second) by DosePro® needle-free technology and standard pre-filled syringe control.

A well-known and characterized monoclonal antibody, Humira® (adalimumab), and accepted assays were selected to characterize protein stability. The therapeutic antibody was used as formulated by the manufacturer (Abbott Laboratories).

Analytical methods selected to characterize stability:

- Dynamic Light Scattering (DLS)
- Size Exclusion Chromatography-High Performance Liquid Chromatography (SEC-HPLC)
- *In vitro* cell-based bioassay: Tumor Necrosis Factor alpha (TNFα) Neutralization.

Adalimumab delivery methods and controls evaluated:

- **DosePro®** – Automatic instantaneous DosePro delivery.
- **Pre-filled Syringe (PFS)** – Manual syringe delivery via standard 30-gauge ½” needle.
- **DosePro Control** – Manual delivery from a DosePro® drug cartridge.
- **PFS Control** – Manual syringe delivery without needle.
- **Pipette Control** – Manual delivery via pipette.

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DosePro® is a registered trademark of Zogenix, Inc.

800.201.2011 | solutions@battelle.org | www.battelle.org

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**DLS Results**

**Purpose**
- Sensitive light scattering analysis used to detect aggregated protein.

**Results**
- Figure 1 shows monodispersity of adalimumab with polydispersity ≤0.2 (red) and an effective molecular diameter (blue) at approximately 13 nm for each sample.
- Figure 2 shows intensity distribution for each sample. This is a highly sensitive evaluation that illustrates the presence of aggregates in all samples.

**SEC-HPLC Results**

**Purpose**
- Liquid chromatography analysis used to detect adalimumab fragmentation and aggregation.

**Results**
- Figure 3 shows all sample chromatograms. There was no difference in adalimumab aggregation and fragmentation among samples.

**TNFα Neutralization Results**

**Purpose**
- In vitro bioassay used to measure adalimumab activity. Activity assay was based on 50% inhibition of TNFα by Humira.

**Results**
- Figure 4 shows adalimumab activity and standard deviation for each delivery method. There was no statistical difference between delivery methods using an analysis of variance model.

**Conclusions**

There was no evidence of adalimumab denaturation after delivery by the DosePro® delivery system. Equivalence of adalimumab biological integrity was demonstrated between DosePro® and PFS delivery systems based on statistical comparisons.