A transformational tool for high throughput screening of stability of liquid formulations

Tulane University professor and PolyRMC founding director, Dr. Wayne Reed, developed a technology termed Simultaneous Multiple Sample Light Scattering (SMSLS), US patent 661844 (2003). This technology is ideal for measuring stability of pharmaceutical and natural products, especially in the area of monitoring protein solution stability. Protein solutions are notoriously prone to aggregation and other modes of instability. SMSLS has been successfully demonstrated on lab scale projects involving stability monitoring of therapeutic proteins, natural products, and synthetic polymers but has not yet been commercialized. SMSLS can simultaneously monitor the stability of virtually unlimited numbers of independent samples for hours, days, months, or longer, all under the control of a single instrument and a single computer, and without any significant human intervention. The potential impact of this technology can be tremendous, especially in the pharmaceutical and natural products industries. Current means of using ultraviolet measurements, dynamic light scattering and other approaches involving multi-channel plates and plate readers are tedious, expensive, and poorly suited for direct measurement of stability.

SMSLS involves simultaneous, independent time dependent total intensity light scattering measurements (not dynamic light scattering) from as many independent samples as desired. The instrument is simple and involves no moving parts. This type of light scattering is exquisitely sensitive to even the slightest changes in molecular weight of the therapeutic proteins, such as aggregation, degradation, denaturation, dimerization, phase separation, etc. The slightest change in stability from each sample is constantly monitored, detected and reported immediately. SMSLS hence combines sensitivity, accuracy and speed with high throughput screening in the pharmaceutical and polymer industries.

SMSLS should be seen as an opportunity for the pharmaceutical and bio-polymer industries to radically increase the accuracy, simplicity, and throughput with which they can measure protein solution stability. Proteins and many other natural and synthetic polymers in solution are often much more unstable than commonly thought. This can actually lead to serious consequences in important applications such as drug shelf life and safety, drug delivery and polymer performance in many biomedical applications. SMSLS tests can help to make sure that polymers are safe for their myriad of applications for human consumption.
The vision for this technology is commercialization and adoption by major pharmaceutical polymer and other biopolymer manufacturers. This technology could revolutionize drug discovery, formulation, and quality control dimensions and accelerate development of new drugs while making existing ones safer and more efficiently produced. Eventually SMSLS analysis could be a required control for FDA approval of drugs, certifying the stability of the drug over time. To accomplish these goals, PolyRMC would have to interface with the pharmaceutical industry. Funding would be required to custom-manufacture and test the instrument for a specific application. This could be more quickly and easily achieved if manufacturers were given some kind of government incentive to apply a new technology. This could be in the form of matching funds from the government or even some kind of tax-credit for new product development and commercialization. The potential benefits of such a technology range from the creation and retention of American jobs to the improvement of quality of life for Americans. This is achieved by increasing the competitiveness of the American firms involved in these industries which translates to larger profits for expansion of payrolls and research endeavors, which ultimately drives the search for cures of many terrible diseases afflicting Americans and others around the globe.

This is why PolyRMC is looking into FDA projects that monitor protein aggregation. The Center for Drug Evaluation and Research (CDER) lists drug characterization as one of its activities and projects. On the CDER website it states that, “DPA is evaluating technologies to characterize biotech products in terms of identity, stability, and purity.”¹ We think that SMSLS is an ideal technology to achieve these goals, and we would like to partner with the CDER or another entity within the FDA to make safety a priority in the characterization of polymers.

**List of SMSLS Publications and patents:**


W.F. Reed US Patent #6,618,144, "Device and method of simultaneously measuring the light scattering from multiple liquid samples containing polymers and/or colloids"

¹ [http://www.fda.gov/cder/offices/otr/DPAresearch.htm#DrugCharacterization](http://www.fda.gov/cder/offices/otr/DPAresearch.htm#DrugCharacterization)