

Training of the FDA PAT Team

Based on recommendations from the PAT Subcommittee of the Advisory Committee for Pharmaceutical Science, a training program was established for the reviewers, inspectors, and compliance officers who are members of the FDA PAT Team. The objective of the program was/is to equip members of the FDA PAT Team with the knowledge necessary to scientifically evaluate the adequacy PAT submissions, while fostering a team concept to the review-inspection process. The certification will require a demonstrated understanding of the fundamentals, importance, and impact of PAT.

Prior to beginning the formal training, it was important to develop the team concept. Consequently, members of the FDA PAT Team participated in a team building exercise in October of 2002. At this event, Team members discussed the direction and goals of the initiative, sharing thoughts from experiences in both review and inspection. Different perspectives from reviewers, inspectors, and compliance officers were discussed, as well as the Team concept to review-inspection for PAT (only trained and certified staff will participate in the PAT approval process).

The format of the inaugural training program included an initial didactic session, followed by three practica, and a final didactic session. An introduction to the basic science underpinning typical pharmaceutical unit operations, as well as emerging technologies, data analysis techniques, and process control strategies, was provided through the initial didactic session. Practica at distinguished centers of the National Science Foundation (NSF) followed, providing more detailed information and demonstrating the utility of various techniques, affording team members hands-on experience with manufacturing processes. A final didactic session summarized the initial training program and allowed discussion of case studies.

Held in December 2002, the initial didactic session covered the following topics: basic science of pharmaceutical unit operations; a review of basic statistics and an introduction to multivariate data analysis; measurement techniques (including spectroscopic, ultrasonic and nuclear); an introduction to process control. Discussions were led by faculty from the universities represented in the practica.

The first practicum was held at the University of Washington, headquarters to the Center for Process Analytical Chemistry (CPAC). During this session the Team was exposed to various sensors and probes under development for process analysis. Additionally, micro-processors, or the “lab-on-a-valve”, were demonstrated, explaining the potential for continuous manufacturing at a small scale.

The second practicum, held at Purdue University, allowed the Team to conduct experiments using many of the tools being considered by the pharmaceutical industry for implementation of the PAT framework. Probes developed at CPAC were also used in the experimentation, to provide continuity to the training. Data gathered during the experiments were to be analyzed at the following practicum.

The final practicum was held at the University of Tennessee, home to the Measurement and Control Engineering Center. The focus of this session was to provide the team with hands-on experience with multivariate data analysis techniques, specifically chemometric analysis. The team learned of the utility and limitation of various chemometric techniques while probing test data, as well as their own data gathered in previous practica. The team was also introduced to control concepts, as well as the utility and limitation of process capability data.

The intense training program for the FDA PAT Team was structured to provide an opportunity for close interaction with members from other FDA organizations, as well as the talented faculty. However, continuing education of the Team will be necessary in maintaining pace with the pharmaceutical industry, such that PAT submissions will continue to be evaluated based on their scientific merit. Efforts toward continuing education include use of the FDA intranet for communicating relevant scientific publications, as well as announcing conferences and workshops. Additionally, a “Sunrise School” and journal club were established for discussing topics germane to PAT, including publications and research. Finally, demonstrations on the utility of PAT tools have been conducted in the laboratories of the Office of Testing and Research at the FDA.