In 2006 the Division of Regulatory Services Feed Program and the laboratory completed 100 years of regulatory work as part of the University of Kentucky (UK) Agricultural Experiment Station. The publication “Commercial Feeds in Kentucky, 2006” issued in 2007 provided the results for the 100th year of regulation of commercial feed and pet food that was marketed and sold in the state of Kentucky. The first state feed law became effective on June 11, 1906 and the regulatory work was assigned to the Experiment Station along with the fertilizer regulatory work that was already being conducted. At that time, nutrition was of primary concern along with ingredient combinations. The laboratory has performed the analytical measurements for the Feed Regulatory Program during this century of regulation. Feed safety and more comprehensive nutritional verification became increasingly more relevant during the last 50 years.

Kentucky has been active in feed regulation dating back to the start of the Association of Feed Control Officials founded in 1910. J. D. Turner, in charge of feedstuffs regulation, for the Agricultural Experiment Station in Lexington, KY was elected the first Secretary of the new association. Later the name evolved to the Association of American Feed Control Officials Incorporated (AAFCO) and meetings are held each year to continue to develop feed regulations. This involves definitions for ingredients and labeling of feed and other issues. The regulatory laboratory has supported these efforts by checking the sample composition and comparing it to the ingredient listing and performing chemical analyses of components and comparing the results to the feed label guarantees.

During this century of service to Kentucky, 238,500+ feed samples have been analyzed (163,500+ samples over the last 50 years). The Feed and Fertilizer Laboratory has accomplished a noteworthy amount of work for the citizens of Kentucky. Inspectors from the Division regularly call on retailers to examine different kinds of feed and pet food registered for sale in the state. For 2006, approximately 15,000 different commercial feeds and pet foods were registered for distribution by 915 feed companies. There were approximately 260 manufacturing facilities that served the Kentucky industry. The feed program took action on 3884 official samples and 86 unofficial samples of commercial feed based on 25,360 analyses. This effort monitored about 3 million tons of commercial mixed feed and feed ingredients. The service by the Division helped to protect consumers in the agricultural businesses of the state and protected citizens in general who purchased pet food or feed for hobby purposes.

Consumer service by the University of Kentucky Agricultural Experiment Station started in 1885. Shortly after this, fertilizer control and then feed control laws were passed in Kentucky. Including the first Director of the Experiment Station, there have been 9 individuals that have directed the efforts of regulating feed in the state. These transitions are documented in Figure 1. The department has benefited from excellent leadership by these individuals during the 100+ years of regulatory feed control.
Figure 1

University of Kentucky
Regulatory Administrators

Dr. Melville A. Scovell – Director, Agriculture Experiment Station (1885)
   Kentucky Law, Regulation of Fertilizer (1886)
Henry E. Curtis, M. S. – Head of Fertilizer (1900)
   Kentucky Law, Regulation of Feed (1906)
Job D. Turner, B. S. – Head of Feed (1906)
Job D. Turner – Head of Department of Feed and Fertilizer (1939)
   A. Bruce Poundstone, M. S. – Head of Department of Feed and Fertilizer (1946)
   - Director, Division of Regulatory Services (1966)
Dr. Herbert F. Massey - Director, Division of Regulatory Services (1971)
Dr. Doyle Peaslee - Director, Division of Regulatory Services (1980)
Dr. David L. Terry - Director, Division of Regulatory Services (1990)
Dr. Wilbur W. Frye - Director, Division of Regulatory Services (1992)
Dr. C. Eli Miller - Director, Division of Regulatory Services (2000)
   Dr. William O. Thom - Director, Division of Regulatory Services (2006)

In 1946, Bruce Poundstone became the Head of the Feed and Fertilizer Department. Later under his leadership, the department was renamed the Division of Regulatory Services and that name has continued until this time. Mr. Poundstone wrote about the first 50 years of feed regulatory service in the 1956 department newsletter and the Kentucky Farm and Home Science newsletter. These newsletters, along with other issues, can be found on the departmental web site (http://www.rs.uky.edu/other/newsletters/index.php). In general, his article reviewed the reasons why Kentucky needed a control law for feed. The leading cause was to deter the shipment of inferior products to Kentucky since neighbor states had control laws that were being enforced. The backbone for enforcement of the law was in the findings of the department laboratory. The analyses provided the quality check on the feed products.

Mr. Poundstone was influential in the area of feed analysis. He helped lead the effort to start the American Association of Feed Microscopy, which later became the Feed Microscopy Division of AOCS. This organization continues to develop excellent microscopy analytical methods and provides training for new microscopists each year. Mr. Poundstone’s newsletter article in 1956 pointed out that chemical analysis provided nutritional data on samples but the microscopic analysis provided the identification of the substances that are combined to produce the feed. This continues to be an important aspect of the feed control activities in the laboratory today. Ingredients on the label are verified by this analytical technique and adulterants are detected. Laboratory staff personnel recently served as secretary of this important organization.
The Feed and Fertilizer Laboratory conducts analyses on feed products each year. Melville Scovell, Director of the Agricultural Experiment Station, established a laboratory in 1886 to analyze fertilizers sold in the state after the legislature passed the fertilizer law. The feed analysis capability was added to the labs in 1906 and the first feed regulatory bulletin was issued in 1907 with findings of the laboratory. The laboratory has been lead by very capable chemists over the years. Through 2006, Feed and Fertilizer Lab Coordinators included Valva Midkiff, Dr. Robert Beine, and Dr. Melton Bryant. Val worked for the department from 1945 until he retired in 1983. Several chemical methods were improved, data quality was enhanced, sample preparation techniques were validated, and analytical efficiency was enhanced by development of multi-sample handling devices. A patent was applied for on his lab inventions. His contributions were effective for feed, fertilizer and soil chemical analysis. Val served in several national organizations in behalf of the department. Bob worked for the department from 1974 until he retired in 2002. He served in several national organizations and helped host scientific meetings in Kentucky. He applied his chemistry and math background to improve and modernize the lab. Computers and electronics were used to automate data flow, record sample weights, and calculate results. Melton continued to improve the lab by use of data systems and automated, modern instrumentation. New analytical capabilities were added to expand the support for the feed program. The implementation of electronic spreadsheets for data recording and calculations has benefited the lab. Lab results are transferred to the feed program electronic database. He served in national feed organizations and associations in behalf of the department and continues to be actively involved with feed issues.

The analysis of feedstuffs has changed since the first feed law. In early 1900s, feeds were simply mixtures of grains and milling by-products and ensuring correct labeling involved protein analysis and microscopic examination. In 1950, the feeds were being analyzed for protein, fat, fiber, and a limited number for calcium, phosphorus, salt, urea, fluorine and manganese.

Since Mr. Poundstone wrote about 50 years of feed regulatory service in 1956, the laboratory has performed many additional types of analyses and has been integral in providing data for feed safety purposes. Gradually in the 60s, feeds were analyzed for drugs and antibiotics. Zoalene, amprolium, chlorotetracycline, oxytetracycline, piperazine, bacitracin, penicillin, sugar and other additives were included in the list of analytes. In 1962, pesticide monitoring started with 8 compounds. The lab analyzed 200 samples for these compounds that year. Several years later this program was discontinued.

In the 70s, the lab expanded the capabilities to analyze copper, zinc, iron, carbadox, tylosin, and vitamin A. The lab added atomic absorption instrumentation for mineral analyses. In the 80s, potassium, cobalt, and lysine methods were developed for feed analysis. The list of medications had grown to 22 different types. High-pressure chromatographic instrumentation and spectrophotometric systems were used for the analysis of drugs.
The analysis of mycotoxins in feed was implemented to protect the health of the animals that are susceptible to these agents. The analysis of aflatoxin was performed in the 80s using thin layer chromatography. In the 90s, aflatoxin, fumonisin, and vomitoxin were analyzed using Elisa chemical methods and these continue in the lab today. The lab recently added a new chromatographic mass spectrometer instrument for more accurate analysis of these and other toxins. The accuracy of the mycotoxin analysis is improved with the instrumental capability. This instrument will also provide the capability to measure drugs at very low levels. New microscopes were added to the lab to enhance feed analysis. Digital camera technology with a microscope has been used to document findings with a photograph. The new compound microscope, with polarized light, provided the capability to detect prohibited protein components in feed. This has become increasingly important in the last few years with the problem of mad-cow disease.

The Division moved to a new facility in 1990 named the Bruce Poundstone building. The new facility was designed to be more efficient and provide more space for all the programs. The laboratory contributed a lot to the facility design partly by the efforts of Dr. Beine and other lab personnel. The new labs provided better work areas and improved safety for the lab operations. Sample preparation and storage areas were improved.

The analysis of protein in feed had used wet chemical techniques over the years. The development of the combustion analysis technique for nitrogen was an improvement for feed analysis. Using combustion analysis, the nitrogen content of grains and feeds is determined and mathematically converted to a protein value. The department added the combustion analytical capability in the early 90s and the labor and chemically intensive method was discontinued. This was a significant improvement and protein analysis continues to be routinely performed on most feeds and grains.

The laboratory added new instrumentation for elemental analysis in 1990. Simultaneous measurement of 10 + elements in a sample was much faster when using the new plasma system. The single element analysis instrumentation used for many years was displaced. Autosampler units with the new instrumentation improved efficiency. In 2002 the laboratory upgraded again to instrumentation that used microchip detection similar to that used in digital cameras. This allowed the ability to measure 30+ elements simultaneously with multiple measurement emission lines and this improved the ability to provide support on feed analysis.

In 1997 over 4000 feed samples were analyzed to support the feed program. The lab performed 57 different analyses. Over 26,500 analyses were performed for the feed regulatory program. Sample numbers increased somewhat for a few years. The average sample support for the second fifty years of feed regulation was 3270 per year.

The department invested in new analytical instrumentation over the years to improve the laboratory capability. This effort continues as we enter the next century of feed regulation. Low levels of contaminant metals will be monitored for feed safety. The efforts to improve the technical excellence of the laboratory continue in order to maintain the feed program as a leader among the state programs. The computerization of the
laboratory has improved operations. Automated instruments and auto-samplers have increased the ability to analyze samples more efficiently. Large groups of samples are processed in order to provide timely support to the feed program.

Since 1956, the laboratory continued to serve on AAFCO committees that deal with the collaborative check sample program, laboratory services, and environmental issues. Dr. Beine coordinated the AAFCO Check Sample Program and served as Vice Chairman of that committee. Valva Midkiff was awarded a Life Membership in AAFCO. Dr. Bryant is currently AAFCO Investigator for Minerals, serves on several AAFCO committees, and performed a methods review for a section of the AOACI Methods Manual. The lab staff also attended ASFFPCO and AOACI Section meetings each year and technical papers were presented at these meetings. Dr. Beine served as President of ASFFPCO for the 1998-1999 year. The lab participated in the AAFCO Collaborative Check Sample program, an Aflatoxin Share Sample Program, the AOCS Microscopy Check Sample Program, and the AOCS Aflatoxin and Fumonisin Check Sample Programs. These programs provided quality evaluations on the lab analyses. Lab personnel performed service for regional and national associations and have hosted meetings in Kentucky. The lab routinely worked with and coordinated with other state laboratories on analytical methods and performed referee sample analyses. These professional functions continued to bring the University of Kentucky and the Division of Regulatory Services recognition in industry, scientific, and regulatory organizations.

The success of the laboratory in performing the analytical chemistry over this second 50 years of feed regulation is a result of the dedication, abilities, and commitment of the lab staff. The laboratory was fortunate to attract very capable and caring individuals. Many of the staff worked well over 30 years in the organization. The excellence of personnel and their constant attention to detail helped maintain the quality of results needed for the feed regulatory functions. Their desire to serve the public and provide this important service for the citizens of Kentucky resulted in the success of the laboratory. To keep pace with the progress in analytical chemistry and increased demands of the feed industry, new and improved methods and techniques were implemented to enhance capabilities and increase efficiency of the lab. The lab personnel adapted to the changes through the years to fulfill the feed program analysis needs.

The second century of laboratory service to support feed regulation and to provide consumer protection for the citizens of Kentucky is important. The complexity of the laboratory work is increasing and the rate of change in feed technology and nutritional information provides future challenges. The international feed and grain marketplace is also placing an increased demand on laboratory capabilities. Working effectively with industry, the scientific community, federal organizations, and feed associations is important for the success of the laboratory. The laboratory continues to support the feed regulatory mission and functions of the Division of Regulatory Services to provide consumer protection for Kentucky citizens.

Melton F. Bryant, Lab Coordinator
October 2007