Synergist® Solutions: Air Sampling

Celebrating the History of Methods and Media
By Debbie Dietrich

Air sampling methods and media in use today reflect the collaboration of scientific professionals from many specialty areas throughout the history of industrial hygiene. As SKC celebrates its 50th anniversary in 2012, I am pleased to provide some of the early history of sampling methods and media in the hope that professionals, young and old, can learn and be inspired. SKC is proud to be part of the lasting legacy of the ingenuity and dedication shown by early pioneers in our field.

Identifying Workplace Hazards

Before the development of sampling methods and media, it was essential to identify workplace hazards through inspections and to share results through publications. According to a 1964 article in Public Health Reports, “In 1905 the Massachusetts State Board of Health became the first known State agency to employ health inspectors to investigate the dangers of occupation,” following the lead of the British Factory Acts. These inspections led to a groundbreaking report with photographs documenting health conditions in factories, and “the seeds of industrial hygiene as a State public health function were sown.”

In 1910, Dr. Alice Hamilton was appointed to the Illinois Occupational Disease Commission to study industrial illness in the state. Initially, Dr. Hamilton focused on lead poisoning while others studied the effects of arsenic, turpentine, carbon monoxide and other hazards. Dr. Hamilton and her team visited factories, reviewed hospital records and interviewed labor leaders to prove the connection between occupation and illness. In an article on the American Chemical Society website, Judah Ginsberg writes, “As a result, the Illinois legislature in 1911 passed an occupational disease law requiring employers to implement safety procedures limiting workers’ exposure to dangerous chemicals, to provide monthly medical examinations for workers in dangerous trades, and to report illnesses to the Department of Factory Inspection, which had prosecutorial authority.” Following her work in Illinois, Dr. Hamilton conducted similar industrial health surveys on a national level at the request of the U.S. Commissioner of Labor.

Early Legislation

In 1936, the U.S. Walsh-Healy Public Contracts Act was passed. This new act established workplace health and safety standards for companies contracted to supply goods and services to the federal government. The Walsh-Healy Act specifically stated that no covered work would be performed in plants, factories, buildings or surroundings, or under “hazardous or unsanitary working conditions” that were dangerous to the health and safety of the employees engaged in the performance of the contract. The safety and health provisions of the Walsh-Healey Public Contracts Act still apply today and are administered by the Occupational Safety and Health Administration (OSHA).
The Walsh-Healey Act stimulated occupational health research and led to the development of industrial hygiene programs on a state level. By 1946, 33 states had passed occupational compensation laws and 40 states had developed governmental industrial hygiene programs.

**The U.S. Public Health Service, NIOSH and OSHA**

An online publication entitled “As They Saw It” provides an interesting perspective on the Public Health Service in 1946. At that time, the Public Health Service was actively converting its activities from emergency health demands during World War II to new fields of health activity during peace time. During these years, the Public Health Service developed a close working relationship with state and local governmental industrial hygiene units and provided grants-in-aid for industrial hygiene purposes. In the 1960s and '70s, the U.S. Public Health Service began conducting surveys of workplaces in major U.S. cities, taking an inventory of occupational hazards and control measures in an attempt to establish national priorities. The predecessor of NIOSH was the Bureau of Occupational Safety and Health (BOSH) in the Environmental Control Administration of the U.S. Public Health Service.

On Dec. 29, 1970, the Occupational Safety and Health Act was passed in the U.S. This legislation created OSHA to conduct workplace inspections and NIOSH to conduct research and recommend occupational safety and health standards. On May 29, 1971, the first OSHA Permissible Exposure Limits (PELs) went into effect based on existing national and consensus standards including the 1968 Threshold Limit Values (TLVs). Four hundred PELs were promulgated under the OSHA Act, and beginning in 1974, NIOSH and OSHA began compiling data on the 400 substances as part of the Standards Completion Program.

**Development of Methods and Media**

With workplace inspections completed and regulations in place, the next critical step for worker health protection was the creation of air sampling methods. During World War I, scientists developed activated charcoals for use in chemical respirators; it was with activated charcoals that scientists started their research for air sampling.

A significant breakthrough occurred in 1964 at the 26th annual meeting of the American Conference of Governmental Industrial Hygienists (ACGIH®) in Philadelphia, Pa. Researchers Otterson and Guy described how to desorb individual contaminants from the charcoal onto which they were collected and analyze the compounds using gas chromatography. On May 16, 1969, at the annual ACGIH conference in Denver, Colo., the first comprehensive sorbent tube method for multiple contaminants was presented. This paper was authored by BOSH scientists Lowell White, David Taylor, Patricia Mauer and Richard Kupel and was published in the March/April 1970 issue of the *American Industrial Hygiene Association Journal*.

As part of the Standards Completion Program, NIOSH developed validated sampling and analytical methods for each of the 400 chemicals in the new OSHA standard. The first *NIOSH Manual of Analytical Methods* was published in 1974. Included in this first edition was P&CAM 127 for 13 organic solvents using charcoal tubes.

**Commercial Production of Sampling Equipment**

With sampling methods in place, a commercial supplier was needed for sorbent tubes and low flow sample pumps. Lloyd Guild, a physical chemist, was running a precision glassware company in Pittsburgh, Pa. called the Scientific Kit Corporation. This company was producing supplies for gas chromatographs, including glass columns. Concerns over air contaminants that were prevalent in this steel town led representatives from the Scientific Kit Corporation to meet with legislators, labor union leaders and eventually NIOSH to discuss worker health issues. In the end, NIOSH asked Guild and his team to prepare samples of the NIOSH charcoal tube design. In 1973, NIOSH placed the first order for 6,000 charcoal tubes with the Scientific Kit Corporation.
NIOSH also needed pumps to use with these tubes. The first NIOSH contract for low flow pumps was awarded to the Sipin Company. Later, the Scientific Kit Corporation also produced a low flow sampler; an updated design is still available today as the 222 Low Flow Pump. In 1979, the Scientific Kit Corporation became known simply as SKC Inc. Today, SKC manufactures hundreds of different sorbent tubes and other samplers for all the sampling methods published by NIOSH and OSHA scientists.

**Vision for the Future**

The history of air sampling methods and media demonstrates commitment and collaboration on the part of professionals working in government, industry and in commercial production. All practicing hygienists should be inspired by the vision shown by these pioneers. Based on their efforts, workers around the world have been protected from toxic air contaminants. We all share in this legacy and continue the vision for the future whether our job is to develop methods, produce sampling media or deploy these valuable tools in our workplace. As SKC looks back on its 50-year history, we never forget that sample collection is about health protection.

*Debbie Dietrich, CIH, is vice president and corporate IH for SKC Inc. She can be reached at (281) 373-3056 or skcdebbie@aol.com.*

**References**


