Radiochemistry and Radiation Protection

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The field of radiochemistry includes isolation, identification, quantitation, methodologies, standards, quality assurance and quality control, statistical methods, accreditation of laboratories, radiobioassay, environmental radiochemistry, and measurement technology. Traditionally, radiochemistry professionals may have focused their efforts on radioanalytical techniques or nuclear chemistry and spent their days in a wet laboratory focused on analyzing bioassay or environmental samples. Today, radiochemists contribute to the larger world of radiation protection by providing an important and highly specialized service to health physicists, safety professionals, and other specialists interested in occupational or public health. In addition, radiochemistry has found its way into other specialties such as nuclear medicine creating new subspecialties like nuclear pharmacy.

Radiochemistry affords the precision, accuracy, and specificity required to provide the market with pure radiochemicals and the radiation safety profession with credible estimates of radiation dose to workers, patients, and members of the public. Laboratory test results must be reproducible to reduce the error of the dose estimate and, of course, they must be accurate. Tests must be able to accurately identify the radionuclide(s) because each radionuclide has its own decay characteristics and isotopes have their unique metabolic properties. As the application of nuclear pharmacy expands, so does the requirement for a thorough understanding of biochemistry associated with antibody reactions, receptor binding, synergistic effects of pharmaceuticals, and significance of radiochemical impurities. Clinical results depend on unfailing applications of radiochemistry, and accurate dose estimates depend on accurate identification and quantitation of low concentrations of radionuclides.

The impact of radiochemistry is significant in the arena of radiolabeling of new chemicals including lipoproteins, hormones, tumor specific antibodies, and other peptides. Without a clear understanding of the principles of radiochemistry, medical advances that depend on radiochemically pure radiolabeled biochemicals would not be possible. Since radiopharmaceuticals form the cornerstone of modern diagnostic and therapeutic nuclear medicine, the field of radiochemistry provides significant contributions to modern trends in nuclear medicine.

High standards in radiochemistry are essential to provide accurate information about radionuclides in the environment, radiation dose from internally deposited radionuclides, and pathophysiological state of the human body. Adequate protection of people and the environment depend on a highly professional field of radiochemistry.