

Program: Production of Nuclear Medicines

Speaker: John Zehner, PharmD – specializing in nuclear pharmacy

Introduced by: Steve Springer

Guests: Jim Boerger, Margaret Fletcher, Steve Sheline

Attendance: 107

Scribe: Larry Hutchison

Editor: Carl Warner

Dr. John Zehner, R.Ph., President and CEO of NukeMed, Inc was our speaker, and he presented an overview of diagnostics and therapies related to radiopharmaceuticals. Dr. Zehner, a graduate of Purdue, entered the field of radiopharmaceuticals in 1990 and today is a recognized authority on the subject. His company, NukeMed, focuses on the manufacture and distribution of radiopharmaceutical products. The company also provides turnkey imaging and production facilities for nuclear medicine, as well as assistance with the handling and automation of radioisotopes, operation of cyclotron facilities and general distribution of radioactive material.

Nuclear medicine allows us to see inside the body and can be used diagnostically and therapeutically. One of the many advantages of nuclear medicine is that it requires minimal amounts of material. Radiopharmaceuticals are taken internally, either intravenously or orally. The risks of low-level exposures are mitigated by a cautious approach recognizing that all human exposure should be kept as low as possible. Most eliminations from the body are through the kidneys or the liver. Kidneys, in general, eliminate chemical molecules that are small, water soluble and have a charge. The liver, on the other hand, eliminates molecules that are large, less water soluble and not charged. Knowledge of this is particularly important in selecting an isotope, attaching the isotope to a carrier molecule and designing the final product so that it targets the tissue of interest.

As noted, nuclear medicine can be used for diagnostics or therapeutics. For diagnostics, an isotope with penetrating emissions, Gamma Photons or Positrons, is chosen. For therapeutics, a particle emitting radionuclide (alpha, beta or conversion electrons) is chosen. In both diagnostic and therapeutic situations, isotope selection is based on the consideration of several factors including availability, half-life, decay products, chemistry and specific activity. Isotopes can be produced by either a reactor or accelerator. When human intervention is required in the production process, a hot cell is employed to protect the worker. Most isotopes are metals although some are non-metallic. Metal isotopes can be difficult to work with in that they are easily contaminated by other metals. Specific activity of the isotope depends on how it is made. Factors can include whether there is a separation involved or if production is in a cyclotron or linear accelerator.

Dr. Zehner discussed several therapeutic isotopes and diagnostic isotopes identifying what characteristics made them the product of choice for a particular treatment or diagnosis. He also told the story that much of the production material that we have today is derived from decaying nuclear weapons left over from the cold war period of many years ago. Maybe something good did come out of that era! Because of this, he has many contacts with Russia. In summary, it is an exciting time for nuclear medicine with therapeutic and diagnostic agents finally making an impact. Large companies (Bayer, J&J, Lilly, etc.) are taking notice, and it is predicted that a significant increase in investment will be taking place in the future.



John Zehner