



FACULTY MENTOR

PhD, Vera, David R.

PROJECT TITLE

Radiopharmacokinetic System Design

PROJECT DESCRIPTION

This project will design a mathematical model of a radiopharmacokinetic system. The model will be used to estimate kidney function based on positron-emission tomography (PET) of a new radiopharmaceutical that binds to a specific receptor within the kidney. Using various engineering techniques, such as sensitivity, identifiability, and receiver operator characteristic analyses, we will adjust the chemical characteristics of the radiopharmaceutical and parameters of the PET imaging protocol to optimize the measurement accuracy and diagnostic performance of the imaging procedure.

This is a multi-disciplinary project, where the intern will work with chemists, physicists, engineers, and physicians to provide a new and powerful imaging technique that will aid in the diagnosis and treatment of patients suffering from kidney disease.

A similar project produced a new radiopharmaceutical for the diagnosis of liver disease. The bibliography below describes the methods.

1. Vera DR, Krohn KA, Scheibe PO, Stadalnik RC. Identifiability analysis of an in vivo receptor-binding radiopharmacokinetic system. *IEEE Trans Biomed Eng.* 1985;BME-32:312-322.
2. Vera DR, Scheibe PO, Banin Y, Stadalnik RC. Local identifiability of a receptor-binding radiopharmacokinetic system having measured parameters of known uncertainty. *IEEE Trans Biomed Eng.* 1994;41:891-897.
3. Vera DR, Scheibe PO, Krohn KA, Trudeau WL, Stadalnik RC. Goodness-of-fit and local identifiability of a receptor-binding radiopharmacokinetic system. *IEEE Trans Biomed Eng.* 1992;BME-39:356-367.
4. Vera DR, Stadalnik RC, Trudeau WL, Scheibe PO. Measurement of receptor concentration and forward binding rate constant via radiopharmacokinetic model of [^{99m}Tc]galactosyl-neoglycoalbumin. *J Nucl Med.* 1991;31:1169-1176.

5. Vera DR, Stadalnik RC, Metz CE, Pimstone NP. Diagnostic performance of a receptor-binding radiopharmacokinetic model. J Nucl Med. 1996;37:160-164.

INTERNS NEEDED

1 BS or MS student

PREREQUISITES

Calculus thru Differential Equations; Computer Programming (FORTRAN or MATLAB)