upon a modification of the autoradiographic model of Sokoloff et al. (19). Sokoloff et al. used (C-14)-2-deoxyglucose (DG) as a glucose tracer for the measurement of cerebral metabolic rate for glucose (CMRGlu). The Sokoloff et al. model (19) is a first order transport model with 3 compartments in which deoxyglucose is transported by the same facilitated mechanism as glucose, except that DG is trapped in the cell in the phosphorylated form of DG-6-PO_4 (Fig. 5). DG-6-PO_4 is not further metabolized due to the inhibition or blocking of the 2 deoxy form of glucose (19). The CMRGlu is given by (19):

$$\text{CMRGlu} = \frac{C_P\left[C_i^*(t) - k_1^* e^{-(k_2^* + k_3^*)T}\int_0^T C_P^*(t) e^{(k_2^* + k_3^*)t} dt\right]}{LC\left[\int_0^T C_P^*(t)dt - e^{-(k_2^* + k_3^*)T}\int_0^T C_P^*(t) e^{(k_2^* + k_3^*)t} dt\right]} \quad (2)$$

where C_P and $C_P^*(t)$ are the mean plasma capillary concentration of glucose and DG, $C_i^*(T)$ is the total DG and DG-6-PO_4 concentration in the tissue, at region i and time T. The k*s are the rate constants for DG transport and phosphorylization between the various compartments (Fig. 5). LC is the lumped constant and is a set of six constants which reflect the rate of phosphorylization, dephosphorylization and volumes of distribution of deoxyglucose to glucose. At steady state, LC is equal to the ratio of the arterial-venous extraction fraction of DG to glucose across the organ of interest. This model assumes that once DG is phosphorylated to DG-6-PO_4 by hexokinase, it is not cleared from the tissue during the time of study. Brain or heart, contain only low activity levels of phosphotase, the enzyme which hydrolyses DG-6-PO_4 $\rightarrow$ DG PO_4.

Our studies indicate that loss of FDG-6-PO_4, although not large, is significant depending upon the time after the injection. Thus, we have rigorously derived a form of the Sokoloff et al. (19) model which includes