

# Simulation of Transport of Lipophilic Compounds in Complex Cell Geometry

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## Introduction

The mathematical modeling of the diffusion and reaction of toxic compounds in mammalian cells is a tough task due to their very complex geometry. The heterogeneity of the cell, particularly the cytoplasm, and the variation of the cellular architecture, greatly affects the behavior of these toxic compounds. Homogenization techniques have been implemented for the numerical treatment of the model. This technique considerably reduces the complexity of the model. To see the behavior of the cell after the inclusion of the toxic compounds, we have implemented the mathematical model in Comsol Multiphysics. The model has been validated against the results published elsewhere. In this paper, we will discuss the results after the effect of change of cell architecture.

This work has been done in 2-dimensional space and can be extended to 3-d and also with more complex reaction systems.

## Cell Reaction-Diffusion Model

The following diagram represents the reaction and diffusion system of a cell which we have analyzed in our paper.

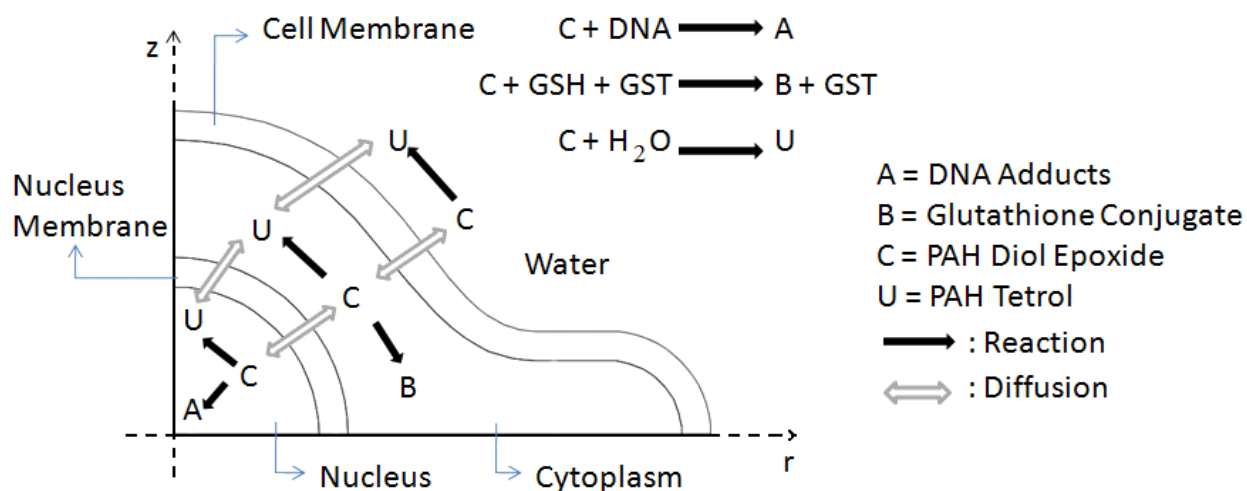


Figure 1. Diagram of Quarter Part of an Axi-symmetric Cell (not to scale) displaying reactions and diffusion in and around a cell