PET-ABC: A Bayesian likelihood-free tool for kinetic models

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Abstract
We describe an intuitive, easy to use method called PET-ABC that enables full Bayesian statistical inference from single subject dynamic PET data. The performance of PET-ABC was compared with weighted non-linear least squares (WNLS) in terms of reliability of kinetic parameter estimation and statistical power for model selection. Dynamic PET data based on 1-tissue and 2-tissue compartmental models were simulated with 2 noise models and 3 noise levels. PET-ABC was used to evaluate the reliability of parameter estimates under each condition. It was also used to perform model selection for a simulated noisy dataset composed of a mixture of 1- and 2-tissue compartment kinetics. Finally, PET-ABC was used to analyze a non-steady state dynamic study performed on a fully conscious rat administered either 2 mg.kg^{-1} amphetamine or saline 20 min after tracer injection.

References

[1] Y. Fan, G. Emvalomenos, C. Grazian, S. R. Meikle, PET-ABC: fully Bayesian likelihood-free inference for kinetic models, Physics in Medicine and Biology, 66 (11), 115002, 2021.