

ORAL PRESENTATION

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The role of systems modeling in drug discovery and predictive health

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Systems biology is the result of a confluence of recent advances in molecular biology, engineering, and the computational sciences. It can loosely be categorized into experimental and computational systems biology. Experimental high-throughput methods, assisted by robotics, image analysis, and bioinformatics, have been used in the drug industry for quite a while, and current screening tests for drug efficacy and toxicity regularly involve genomic, proteomic, and molecular modeling approaches. By contrast, the role of computational methods of biological systems analysis is still emerging. This presentation focuses on computational systems modeling and its increasingly important role at several junctures of the drug development pipeline. Examples to be discussed include mathematical models for receptor dynamics, pharmacokinetics, and metabolic and signaling pathway analysis. In the context of the latter, Biochemical Systems Theory is proposed as a highly advantageous default framework for model design, diagnostics, manipulation, and system optimization. The development of dynamic models for complex disease processes permits the straightforward inclusion of methods for custom-tailoring models, which is a key step toward personalized medicine and predictive health [1-5].

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