

P007 Understanding drug action: building prediction in cell-based systems - CYTOMICS

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A major aim of systems biology is to gain an understanding of dynamic bounded systems for the purpose of prediction and modification, an approach that offers enormous potential in the drug discovery arena. Our strategy is to derive models capable of developing *in silico* cell response fingerprints for use in drug screening and therapeutics. Critical to realizing this aim is the development of mathematical tools to address problems of spatio-temporal cellular heterogeneity, stochasticity and scaling for the impact of drugs on cell populations and to use these tools in making fundamental advances in our understanding of drug targeting in complex neoplastic systems. The drive for this approach is to gain insights of how dynamic and temporal interactions of a drug with its molecular target can be affected by (i) drug delivery constraints and cellular micro-pharmacokinetics (mPK), and (ii) impact upon cell proliferation and death which comprise the pharmacodynamics (PD) of a tumour population. We have brought together innovative tools to permit multi-scalar data collection to inform on both mPK and PD effects for *in vitro* tumour populations. This approach encompasses the accurate monitoring of the integrated response to drug action using high throughput screening technologies. By tracking drug-target interactions, using non-linear microscopy approaches, we have been able to build uniquely identifiable mathematical models to predict the routes for evasion of drug action and thereby address the appearance of resistant sub-populations.