Cell PyAbility draft

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**Title**

CellPyAbility: a streamlined toolkit for assessing cell viability

**Summary**

Across cell biology, assessing viability and proliferation in response to chemical gradients is often essential. Herein, we provide a cell viability “starter kit” that includes detailed protocols for high-throughput cell viability assays in response to a single agent or two agents in combination at varying concentrations with several advantages over other methods. We also provide two automation tools tailored to the protocols that output detailed tabular and graphical analyses of the experiment from bulk raw image input.

**Introduction**

Across disparate fields of cell biology, researchers often use dose-response curves to determine the relationship between a chemical and cell viability. In cancer biology, our lab often uses short-term (5-day) cell viability assays to assess the selectivity of drugs against specific genetic alterations found in tumors. For example, the DNA repair protein methylguanine methyltransferase (MGMT) directly removes certain alkylation products from the *O6*-position of guanine in DNA. MGMT is hypermethylated in some tumors, abrogating expression of the protein and resulting in sensitivity to certain DNA-damaging agents. Normal tissue retains MGMT expression and is therefore resistant to these agents. Using the high-throughput methods described herein, we assessed novel compounds for their selectivity against MGMT-deficient tumor cells and identified a highly selective compound that overcame a common mechanism of resistance in glioblastoma, a deadly brain cancer. While assessing a gene-drug interaction in cancer is one example, the assay could be similarly applied to determining the potency of environmental toxins, the efficacy of anti-microbial agents, the growth benefit of a metabolite, or various other applications spanning cell biology.

Similarly, a researcher may want to assess how two chemicals act in combination with one another across a wide range of concentrations.