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Evolutionary model gives strategy for targeted cancer therapies

Targeted drug treatment reduces tumour volume, but sadly there is almost always recurrence. We propose a simple model to understand this mechanism. We see that each cancer consists of a diverse population of cell phenotypes. However, the diversity of these phenotypes has a limited range, and we model this. We use targeted therapy on multiple cell lines: the treatment fails because of the diversity within the cancer. We fit our model to this experimental behaviour. A second experiment shows that drug sensitivity returns in a treatment holiday. The experiment shows further that our cancer cell line consists of distinct sub-populations. The fundamental effect of the targeted therapy is to eradicate some of the sub-populations. Extending our model, we see that combination therapies fail when resistant landscapes overlap. In contrast, combination therapies will succeed when resistant landscapes are distinct.