



Modelling cell response to cancer drug treatment identifies dynamic features of efficient cell death initiation, enabling prediction and control of therapeutic response heterogeneity

Marielle Péré, Madalena Chaves, Jérémie Roux

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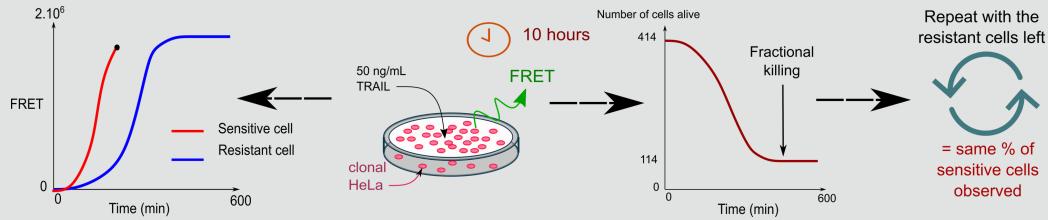
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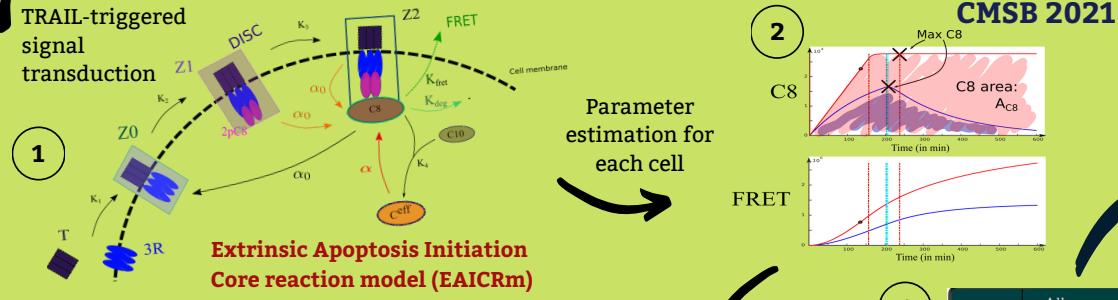
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Marielle Péré, Madalena Chaves, Jérémie Roux - marielle.pere@inria.fr - Université Côte d'Azur, France

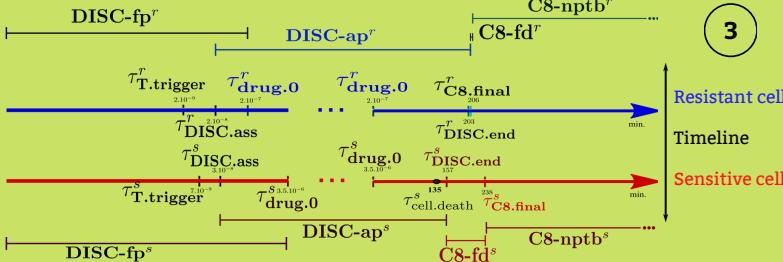
1 - Studying non-genetic resistance in cancer - Roux et al., MSB 2015



2 - Modeling pro-apoptotic drug response and timeline analysis - Péré et al., CMSB 2021

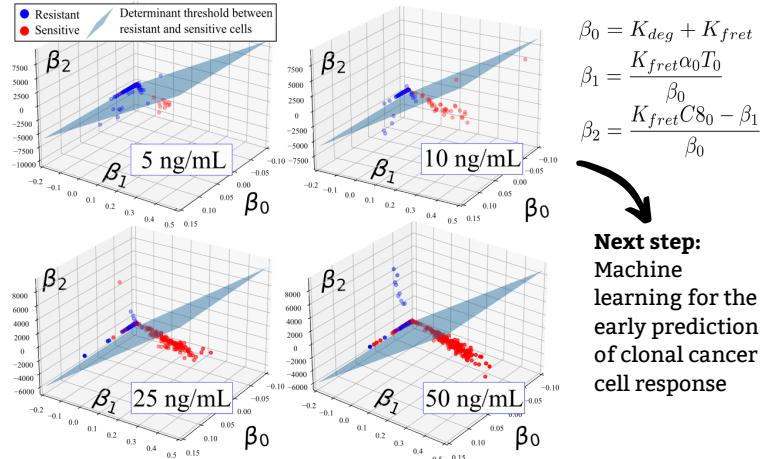


Apoptosis initiation key-times for dynamic solution analysis



3 - A cell decision threshold with potential predictive value - Péré et al., FOSBE 2022

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$$\begin{aligned}\beta_0 &= K_{deg} + K_{fret} \\ \beta_1 &= \frac{K_{fret}\alpha_0 T_0}{\beta_0} \\ \beta_2 &= \frac{K_{fret}C_{80} - \beta_1}{\beta_0}\end{aligned}$$

Next step:
Machine learning for the early prediction of clonal cancer cell response

4 - Principal Process Analysis (PPA)

var.	All experience	$[0 \ \tau_{T,trigger}]$	$[\tau_{T,trigger}, \tau_{DISC,ass}]$	$[\tau_{DISC,ass}, \tau_{drug,0}]$	$[\tau_{drug,0}, \tau_{DISC,end}]$	$[\tau_{DISC,end}, \tau_{C8,final}]$	$[\tau_{C8,final}, \tau_{cell.death}]$
\dot{T}	$-K_1 TR^3$				$+K_1 Z_0$	$+K_1 Z_0$	$+K_1 Z_0$
\dot{R}	$-3K_1 TR^3$				$+3K_1 Z_0$	$+3K_1 Z_0$	$+3K_1 Z_0$
\dot{Z}_0		$K_1 TR^3$ $-K_2 Z_0 pC8^2$	$K_1 TR^3 + \alpha_0 Z_1$ $-K_2 Z_0 pC8^2$ $+K_2 Z_1$	$K_1 TR^3 + \alpha_0 Z_1$ $-K_2 Z_0 pC8^2$ $+K_2 Z_1$	$+K_1 Z_0$ $-K_2 Z_0 pC8^2 - K_1 Z_0$	$+K_1 Z_0$ $-K_2 Z_0 pC8^2 - K_1 Z_0$	$+K_1 Z_0$ $-K_2 Z_0 pC8^2 - K_1 Z_0$
$p\dot{C}8$		$-K_2 Z_0 pC8^2$		$2K_2 Z_1$	$+2K_2 Z_1$	$+2K_2 Z_1$	$+2K_2 Z_1$
\dot{Z}_1		$K_2 Z_0 pC8^2$		$-\alpha_0 Z_1 - K_2 Z_1$	$-\alpha_0 Z_1 - K_2 Z_1$	$-\alpha_0 Z_1 - K_2 Z_1$	$-\alpha_0 Z_1 - K_2 Z_1$
\dot{Z}_2		$K_3 Z_1 C8$		$-K_3 Z_2 - \alpha_0 Z_2$	$-K_3 Z_2 - \alpha_0 Z_2$	$-K_3 Z_2 - \alpha_0 Z_2$	$-K_3 Z_2 - \alpha_0 Z_2$
$C\dot{eff}$		$K_4 C10 Z_2$		$-\alpha C^{eff}$	$-\alpha C^{eff}$	$-\alpha C^{eff}$	$-\alpha C^{eff}$
C_{10}		$-K_4 C10 Z_2$		αC^{eff}	αC^{eff}	αC^{eff}	αC^{eff}
$\dot{C}8$	$\alpha_0 Z_1$	$-K_{deg} C8$		$-K_{deg} C8$	$-K_{deg} C8$	$-K_{deg} C8$	$-K_{deg} C8$
\dot{FRET}	$K_{fret} C8$						