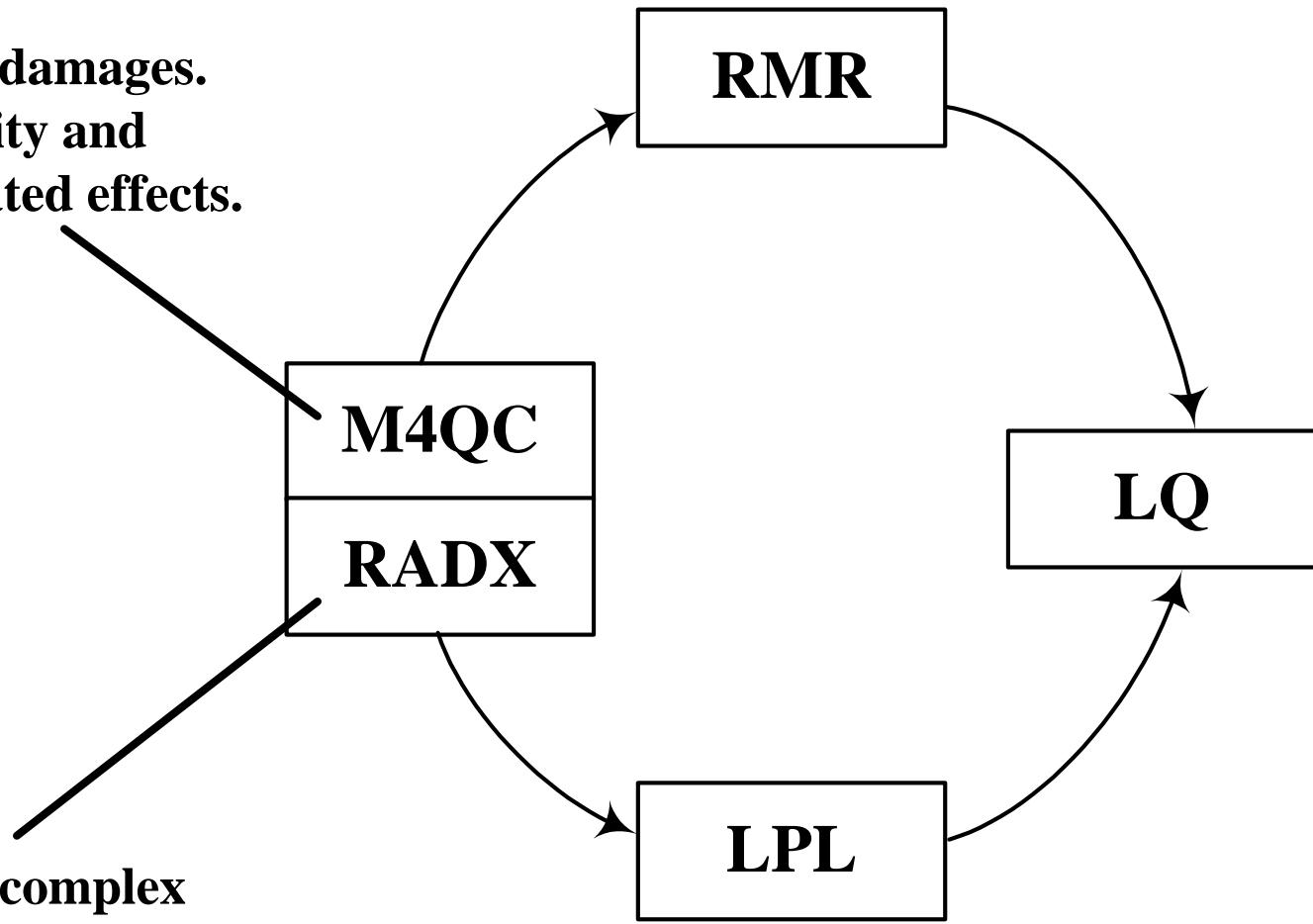


# Relationship to Other Models

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**Multiple DNA damages.  
Lesion proximity and  
chromatin-related effects.**

**Easily specify complex  
exposure situations.**



# M4QC

## *Repairable DNA Damages*

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For all types of repairable DNA damage, the expected number of repairable DNA lesions is determined by

$$\begin{aligned} \frac{d\bar{L}_i(n,t)}{dt} = & 2\dot{D}(t)Y_n \Sigma_i(n) - \left\{ \mathbf{I}_i(n) + \bar{\mathbf{e}}_i(n,t) + \sum_{l=1}^N \sum_{m=1}^Q \sum_{j=1}^{N_r} \mathbf{h}_{i \rightarrow l}(n; j, m) \bar{L}_j(m, t) \right\} \bar{L}_i(n, t) \\ & + \sum_{l=1}^{N_r} \bar{L}_l(n, t) \left\{ [1 - \bar{a}_l(n)] \bar{\mathbf{b}}_{l \rightarrow i}(n) \mathbf{I}_l(n) + \sum_{m=1}^Q \sum_{j=1}^{N_r} \mathbf{h}_{l \rightarrow i}(n; j, m) \bar{L}_j(m, t) \right\} \\ & + \sum_{l=1}^{N_r} \bar{\mathbf{e}}_{l \rightarrow i}(n, t) \bar{L}_l(n, t). \end{aligned}$$

# M4QC

## *Lethal and Non-lethal Genetic Alterations*

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### Non-Lethal (mutations)

$$\frac{d\bar{M}_k(n,t)}{dt} = \sum_{i=1}^{N_r} \bar{L}_i(n,t) \left\{ I_i(n)[1 - \bar{a}_i(n)] \bar{b}_{i \rightarrow k}(n) + \sum_{m=1}^Q \sum_{j=1}^{N_r} \mathbf{h}_{i \rightarrow k}(n; j, m) \bar{L}_j(m, t) \right\} \\ + \sum_{i=1}^{N_r} \bar{\mathbf{e}}_{i \rightarrow k}(n, t) \bar{L}_i(n, t).$$

### Lethal

$$\frac{d\bar{L}_f(t)}{dt} = 2\dot{D}(t)Y\bar{\Sigma}_f + \sum_{n=1}^Q \sum_{i=1}^{N_r} \bar{L}_i(n,t) \left\{ I_i(n)[1 - \bar{a}_i(n)] \bar{b}_{i \rightarrow f}(n) + \bar{\mathbf{e}}_{i \rightarrow f}(n, t) \right\} \\ + \sum_{n=1}^Q \sum_{i=1}^{N_r} \bar{L}_i(n,t) \sum_{m=1}^Q \sum_{j=1}^{N_r} \mathbf{h}_{i \rightarrow f}(n; j, m) \bar{L}_j(m, t).$$