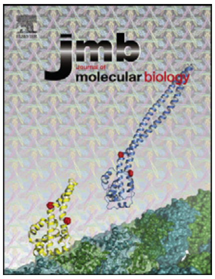
Corrigendum



Corrigendum to "Statistical Mechanics of Monod–Wyman–Changeux" [J Mol Biol 425 (9) (May 13 2013) 1433-1460]

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We correct an error in Eq. (33) of Ref. [1], which was proposed as a solution to the following ordinary differential equation

$$\frac{dx}{dt} = M(c(t))x(t) \tag{1}$$

where $c(t)$ is a time-varying ligand concentration and $M(c(t))$ is a matrix that depends on the ligand concentration. The proposed analytic solution read $x(t) = e^{\int_0^t M(c(t'))dt'}x(0)$. This only holds when $M(c(t))$ commutes with $M(c(t'))$ for different times $t \neq t'$ for all $t, t' > 0$. In other words, Eq. (33) *only* holds when $c(t)$ is constant. This error carries over into Eq. (35) of Ref. [1], in which we write that the probability of an ion channel being open at any time is $p_{\text{open}}(t) = P_R e^{\int_0^t M(c(t'))dt'}x(0)$. It is true that

$$p_{\text{open}}(t) = P_R x(t), \tag{2}$$

and thus Eq. (35) in Ref. 35 holds as written when $c(t)$ is *not* time varying. Fortunately, the example presented in Fig. 12 of Ref. [1] is correct because it analyzed the case in which $c(t)$ is a constant over the integrated times. We are currently unaware of an analytic approach to solving the full time-dependent case, though the Magnus expansion finds approximations to a matrix $\widetilde{M}$ such that $x(t) = e^{\widetilde{M}}x(0)$ solves Eq. (1). We are sorry for any confusion caused by this error.

Reference

[1] Marzen S, Garcia H, Phillips R. Statistical mechanics of Monod–Wyman–Changeux (MWC) models. J Mol Biol 2013; 425:1433–60.