

Anisotropic diffusion deviates chicken embryo chorioallantoic membrane assay (CAM) to reflect inherent therapeutic behaviors

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摘要

Abstract

Chorioallantoic membrane assay (CAM) has become a widely used tool for determination of anti-angiogenesis capability of many drugs including herbal extracts. Because varying results in same set of chicken embryos are often encountered, we developed the complex diffusion model that combined the Fick's second diffusion law, chemical – protein interaction (or binding) to explain the diffusion- or kinetic-limiting phenomena in egg white when performing CAM. In addition, we performed diffusion studies in egg white with Color Blue No. 1, Evans Blue, Color Red No. 40, and the aqueous extract of Psidium guajava budding leaves (PE) to support our model. Under same conditions, the diffusion coefficients of Blue No. 1, Evans Blue, Red No. 40, and PE were $(2.0 - 2.8) \times 10^{-9}$, $(0.89 - 31) \times 10^{-9}$, $(2.8 - 12) \times 10^{-9}$, and $(7.0 - 21) \times 10^{-9} \text{ m}^2 \text{ s}^{-1}$, respectively, depending upon the distance diffused. Whilst at the interface of egg white and embryo (egg yolk), a site about 1 cm apart from the aeration sac, the percent concentration reached only 10.5, 3.0, 3.6, and 2.2% of the original applied medicine, respectively. We conclude that CAM could only serve as a preliminary screening tool for angiogenesis, because the anisotropic diffusion in egg white affects greatly the effective dosages of medicines tested.