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**چکیده**

Dinh

**واژه‌های کلیدی:**

**مقدمه**

ATP

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R<sub>N</sub>

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(d = )

(R<sub>C</sub>)

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(R<sub>N</sub>)

Smith Simmons .

(V)

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$$K_s = \frac{k_s}{k'_s}$$

[ - ]

s  
( )  $\tilde{C}_s(r, t)$   
t r

$$\frac{\partial \tilde{C}_0}{\partial t} = \left( k'_{-1} \tilde{C}_{-1} + k'_{+1} \tilde{C}_{+1} + k'_2 \tilde{C}_2 \right) - \left( k_{-1} \tilde{C}_0 + k_{+1} \tilde{C}_0 + k_2 \tilde{C}_0 \right) + D_0 \frac{1}{r} \frac{\partial}{\partial r} \left[ r \frac{\partial \tilde{C}_0}{\partial r} \right] \quad (-)$$

$$\frac{\partial \tilde{C}_{+1}}{\partial t} = \left( k_{+1} \tilde{C}_0 - k'_{+1} \tilde{C}_{+1} \right) - \frac{V_{+1}}{r} \frac{\partial}{\partial r} \left( \tilde{C}_{+1} r \right) \quad (-)$$

$$\frac{\partial \tilde{C}_{-1}}{\partial t} = \left( k_{-1} \tilde{C}_0 - k'_{-1} \tilde{C}_{-1} \right) - \frac{V_{-1}}{r} \frac{\partial}{\partial r} \left( \tilde{C}_{-1} r \right) \quad (-)$$

$$\frac{\partial \tilde{C}_2}{\partial t} = \left( k_2 \tilde{C}_0 - k'_2 \tilde{C}_2 \right) + D_2 \frac{1}{r} \frac{\partial}{\partial r} \left[ r \frac{\partial \tilde{C}_2}{\partial r} \right] \quad (-)$$

$V_{\pm 1}$

$D_0$

$D_2$

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(  $V_{+1} \approx V_{-1} \approx V$  )

$$\Pi \frac{\partial c}{\partial \tau} \approx \Phi \frac{1}{\xi} \frac{\partial (c\xi)}{\partial \xi} + \Omega \frac{1}{\xi} \frac{\partial^2 (c\xi)}{\partial \xi^2} + \Delta \frac{1}{\xi} \frac{\partial}{\partial \xi} \left[ \xi \frac{\partial c}{\partial \xi} \right] \quad ( )$$

$$\tilde{C}(r, t) = \sum \tilde{C}_s(r, t), c = \frac{\tilde{C}}{C_0}, \xi = \frac{r}{R_c}, \tau = \frac{tV}{R_c}, K_s = \frac{k_s}{k'_s},$$

$$\xi_N = \frac{r_N}{R_c}, \tilde{D}_2 = \frac{D_2}{VR_c}, \tilde{D}_0 = \frac{D_0}{VR_c}, \Pi = 1 + K_{+1} + K_{-1} + K_2$$

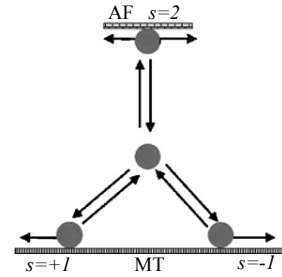
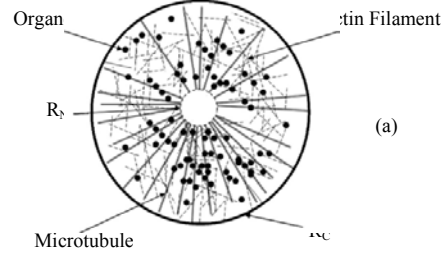
$$\Phi = K_{-1} - K_{+1}, \Delta = \tilde{D}_2 K_2 + \tilde{D}_0$$

$$\Omega = \frac{V}{R_c} \left( \frac{K_{+1}}{k'_{+1}} \left( 1 + \frac{\Phi}{\Pi} \right)^2 + \frac{K_{-1}}{k'_{-1}} \left( 1 - \frac{\Phi}{\Pi} \right)^2 + \frac{K_2}{k'_2} \left( \frac{\Phi}{\Pi} \right)^2 \right)$$

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$k'_s, k_s$



$R_N, R_C$  : (a)

(b)

$s = 0$  :

$s = -$  MT

$s = +$

$s =$  MT

$V-, V+, AF$

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$s =$  :

$s = +$

$s = -$

. AF

$s =$

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$\Delta t = 0.1$

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(N=0)

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### نتایج و بحث

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$N$

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$R_C = \mu m \quad R_N = \mu m$

Dinh

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$$\left\{ \begin{array}{l} N_0 |_{r=R_C} = N_{+1} |_{r=R_C} \\ N_0 |_{r=R_N} = N_{-1} |_{r=R_N} \end{array} \right.$$

( - )

$$N_{+1} |_{r=R_N} = 0$$

( - )

$$N_{-1} |_{r=R_C} = 0$$

( - )

$$\left\{ \begin{array}{l} N_2 |_{r=R_C} = 0 \\ N_2 |_{r=R_N} = 0 \end{array} \right.$$

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( b )

$s = \nu \quad s = - \quad s = + \nu$

( )

(s = )

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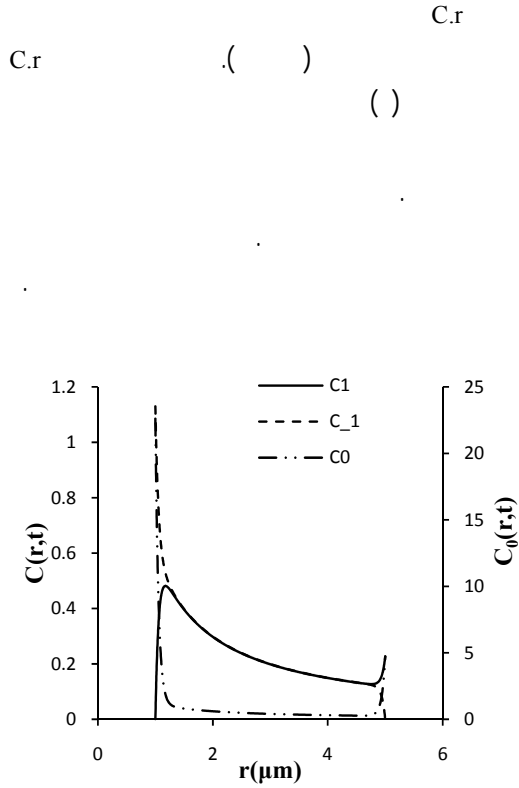
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$(k_1 = k_{-1} \& k'_1 = k'_{-1})$

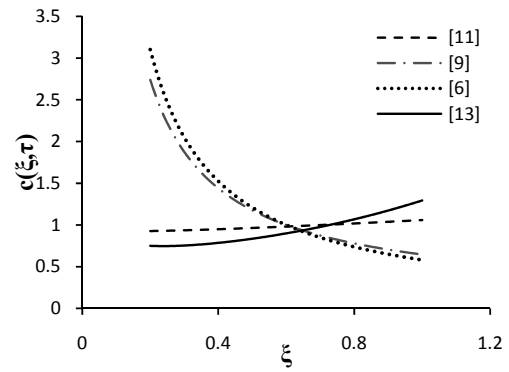
(C-1 C1)

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) [ ]  
(



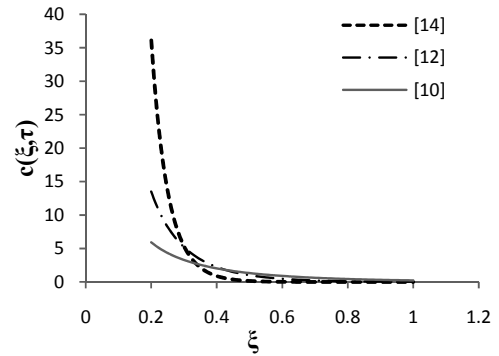
Organelle No.	1	12
Organelle/ Conditions	Endosomes/ dextran	Melanosomes/ aggregation
$k_1$	0.16	0.05-0.2
$k_{-1}$	0.16	0.6-2
$k_2$	-	0.1-0.2
$k'_1$	0.32	5.00
$k'_{-1}$	0.32	0.6-0.8
$k_2$	-	0.1-0.3
$V$	0.35	0.4-0.6
$D_0$	$\sim 10^{-3}$	$\sim 10^{-3}$
$D_2$	-	0.0388



:C\_1 C\_1.( ) r ( )

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( ) ( )  
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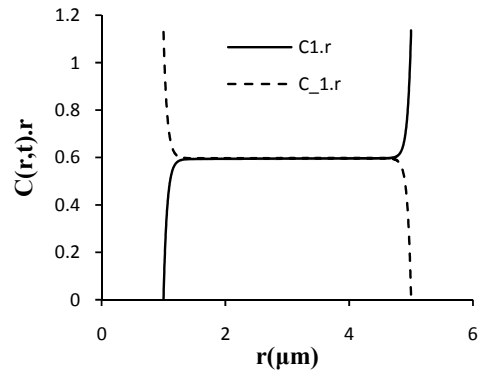
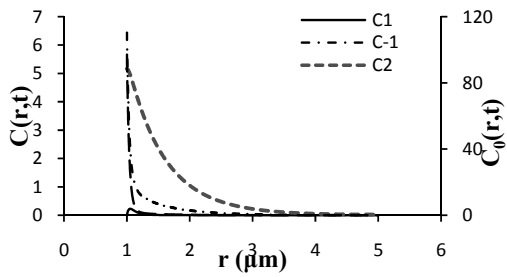
Smith Simmons  
[ ]  
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x ( )  
Smith Simmons



(V k' k)  
( $V_{+1} = V_{-1}$   $k'_{+1} = k'_{-1}$   $k_{+1} = k_{-1}$ )

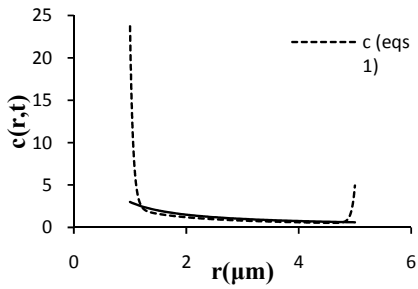
( ) ( )  
( - )

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 ( ) ( ) ( )  
 ( - ) ( - )  
 ( - ) ( - )  
 $\beta_1 = \beta_2 = 0$   
 $\alpha_1 = \alpha_2 = 1$   
 $\beta_1 = \beta_2 = 0$   
 $k'_{+1} = k'_{-1} = 0$   
 Simmons  
 Smith



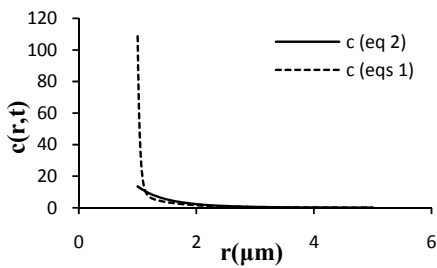
( ) ( ) :  
 $C_2 C_1$  ( ) r ( )  
 $C_{-1}$

( ) ( ) :  
 $C.r$  :  
 $s = -$   $s = +$



( ) ( )  
 $s = +$ )

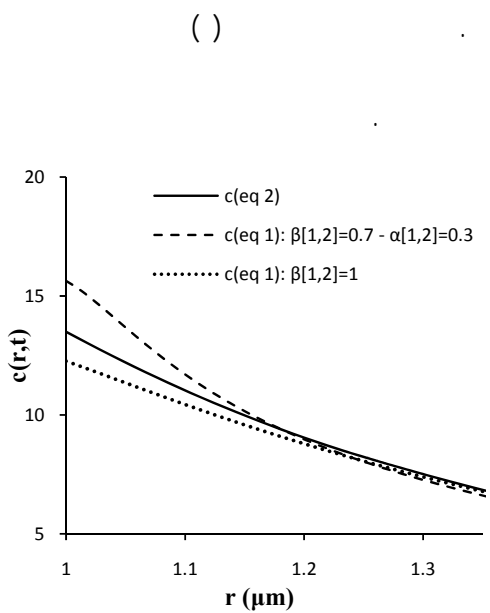
( ) ( )  
 $(s = \gamma \quad s = -$   
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 ( ) ( )



c (eq 2)

( ) ( ) :  
 ( ) ( ) r

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( ) :  
 ( ) ( )  $r$   
 $\beta_i \alpha_i$  ( )  
**نتیجه گیری**  
 Dinh

$$\begin{cases} N_0 |_{r=R_C} = 0 \\ N_0 |_{r=R_N} = 0 \end{cases} \quad ( - )$$

$$N_{+1} |_{r=R_N} = \alpha_1 \cdot N_{-1} |_{r=R_C} \quad ( - )$$

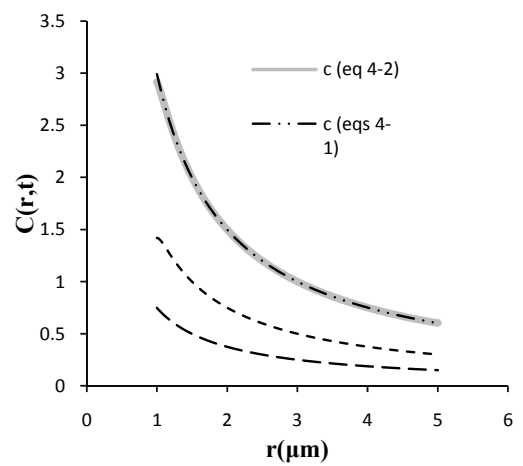
$$N_{-1} |_{r=R_C} = \alpha_2 \cdot N_{+1} |_{r=R_N} \quad ( - )$$

$$\begin{cases} N_2 |_{r=R_C} = \beta_1 \cdot N_{+1} |_{r=R_C} \\ N_2 |_{r=R_N} = \beta_2 \cdot N_{-1} |_{r=R_N} \end{cases} \quad ( - )$$

$$\alpha_1 + \beta_1 = 1 \quad ( - )$$

$$\alpha_2 + \beta_2 = 1 \quad ( - )$$

( ) ( )



$r$  ( ) :  
 ( ) ( ) ( )  
 $\beta = \beta = \alpha = \alpha =$   
 ( )  
 ( ) ( - ) ( - )

$$0.5 < \beta_i < 0.7$$

$$0.5 < \alpha_i < 0.7$$

( Dinh )  
( )

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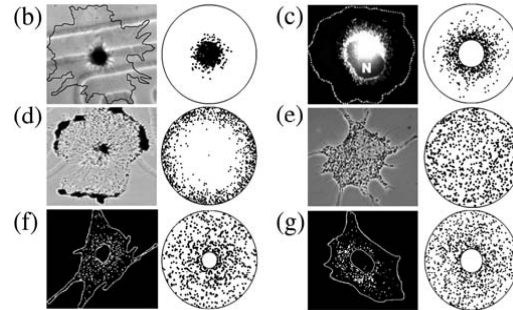
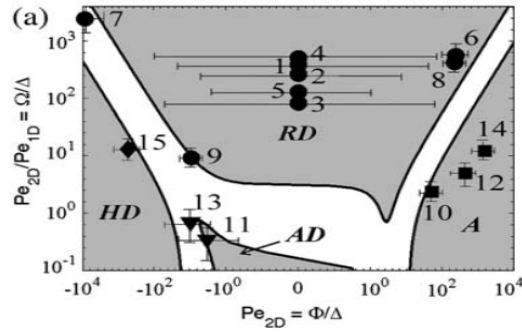
واژه‌های انگلیسی به ترتیب استفاده در متن

- 1- Organelle
- 3- Cytoskeleton
- 5- Dynein
- 7- Microtubule
- 9- Individual-Based Approaches
- 11- Aggregation
- 13- Areal Dispersion
- 15- Facilitated Diffusion
- 17- Finite Element Method

- 2- Vesicle
- 4- Kinesin
- 6- Myosin
- 8- Actin Filaments
- 10- Population-Based Approaches
- 12- Radial Dispersion
- 14- Hyper Dispersion
- 16- Advection-Diffusion

( ) Dinh  
 $(Pe_{1D} = \Phi/\Omega \quad Pe_{2D} = \Phi/\Delta)$

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(RD) (A) : Dinh (a. -  
 lipoprotein ( ) dextran : (HD) (AD)  
 : ( ) HepG2 COS-7 ; ( ) polyethylenimine-DNA ( )  
 ( ) control CHO ; ( ) tautransfected CHO ( ) control CHO  
 ; ( ) ( ) ; ( ) tautransfected CHO  
 ( ) (b-g). ( ) ( )  
 (c). (b). ( )  
 AF (d). tautransfected CHO  
 (g) (f). Xenopus (e).  
 .Drosophila S2