Investigating the effect of drug release on in-stent restenosis: a hybrid continuum – agent-based modelling approach

Supplementary Material

Anna Corti[1,†], Alistair McQueen[2,†], Francesco Migliavacca[1], Claudio Chiastra[3] and Sean McGinty[2*]

1. Laboratory of Biological Structure Mechanics (LaBS), Department of Chemistry, Materials and Chemical Engineering "Giulio Natta", Politecnico di Milano, Milan, Italy
2. Division of Biomedical Engineering, University of Glasgow, Glasgow, UK
3. PoliTo[BIO]Med Lab, Department of Mechanical and Aerospace Engineering, Politecnico di Torino, Turin, Italy

[†] The authors contributed equally to this work and share first authorship

***Address for correspondence:**

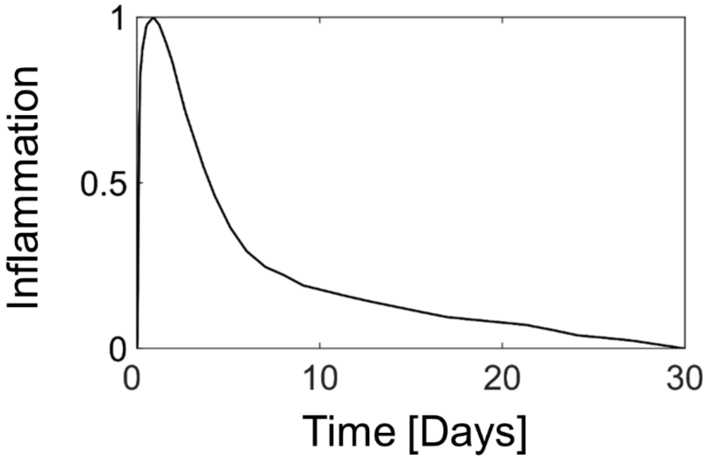
Sean McGinty, PhD

Division of Biomedical Engineering, University of Glasgow, Glasgow, UK

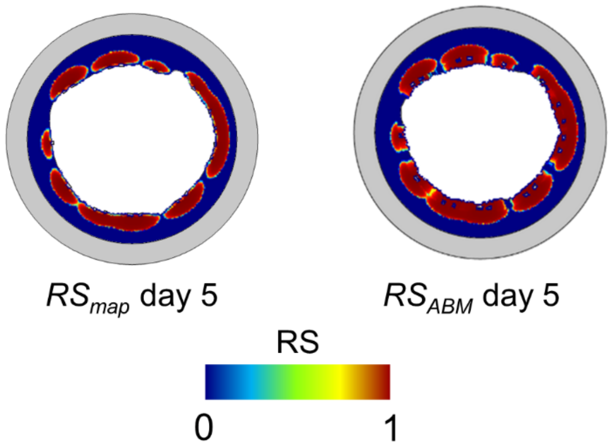
Sean.Mcginty@glasgow.ac.uk

Supplementary Table 1. Parameters of the drug transport model.

Parameter	Description	Value [unit]	Reference
D_p	Effective polymer coating diffusion coefficient	See Table 5	-
$D_{m,r}$	Effective radial diffusion coefficient in the media	$7 \times 10^{-12} m^2 s^{-1}$	Levin et al., 2004 [1]
$D_{m,\theta}$	Effective circumferential diffusion coefficient in the media	$4 \times 10^{-11} m^2 s^{-1}$	Levin et al., 2004 [1]
D_a	Effective diffusion coefficient in the adventitia	$4 \times 10^{-12} m^2 s^{-1}$	Escuer et al., 2020 [2]
P_{eel}	Permeability of the EEL	$9.6 \times 10^{-6} m\, s^{-1}$	Escuer et al., 2020 [2]
s_{eel}	Sieving coefficient in the EEL	1	Escuer et al., 2020 [2]
k_{on}^{ns}	Non-specific binding on rate	$2\ m^3\ mol^{-1}\ s^{-1}$	Tzafriri et al., 2009 [3]
k_{off}^{ns}	Non-specific binding off rate	$5.2 \times 10^{-3}\ s^{-1}$	McGinty and Pontrelli, 2016 [4]
b_{max}^{ns}	Non-specific binding site density	$0.363\ mol\, m^{-3}$	Diaz et al., 2003 [5]
k_{on}^{s}	Specific binding on rate	$800\ m^3\ mol^{-1}\ s^{-1}$	Diaz et al., 2003 [5]
k_{off}^{s}	Specific binding off rate	$1.6 \times 10^{-4}\ s^{-1}$	Diaz et al., 2003 [5]
b_{max}^{s}	Specific binding site density	$3.3 \times 10^{-3}\ mol\, m^{-3}$	Diaz et al., 2003 [5]
M_w	Molecular weight of sirolimus	$914.2\ g\, mol^{-1}$	Levin et al., 2004 [1]
ρ_p	Plasma density	$1060\ kg\, m^{-3}$	Bozsak et al., 2014 [6]
μ_p	Plasma dynamic viscosity	$7.2 \times 10^{-4} Pa\ s$	Bozsak et al., 2014 [6]
ϕ_m	Media porosity	0.258	Ai and Vafai, 2006 [7]
ϕ_a	Adventitia porosity	0.85	Ai and Vafai, 2006 [7]
γ_m	Media hindrance coefficient	0.845	Escuer et al., 2020 [2]
γ_a	Adventitia hindrance coefficient	1	Escuer et al., 2020 [2]
K_m	Darcy permeability in media	$2 \times 10^{-18}\ m^2$	Zunino 2004 [8]
K_a	Darcy permeability in adventitia	$2 \times 10^{-18}\ m^2$	Vairo et al., 2010 [9]
$L_{p,eel}$	Hydraulic conductivity of EEL	$2.2 \times 10^{-9} m^2\, s\, kg^{-1}$	Escuer et al., 2020 [2]
ρ_w	Density of wet arterial tissue	$0.983\ g\ ml^{-1}$	Tzafriri et al., 2012 [10]



Supplementary Figure S1. Generic inflammatory curve, inspired from literature [11].



Supplementary Figure S2. Left: Receptor saturation (RS) map computed by the drug transport module at day 5; Right: Adaptation of the RS_{map} at day 5 to the remodelled agent-based model arterial cross-section (RS_{ABM}). In RS_{ABM}, RS of the media layer derives from the RS_{map} computed by the drug transport module while RS in the neointima is added within the ABM and assumed to radially reflect the RS contour in the media.

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