pharmaceutics

MDPI

Supplementary Materials: Customizable 3D-printed Implants Containing Triamcinolone Acetonide: Development, Analysis, Modification, and Modeling of Drug Release

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Supplementary information:

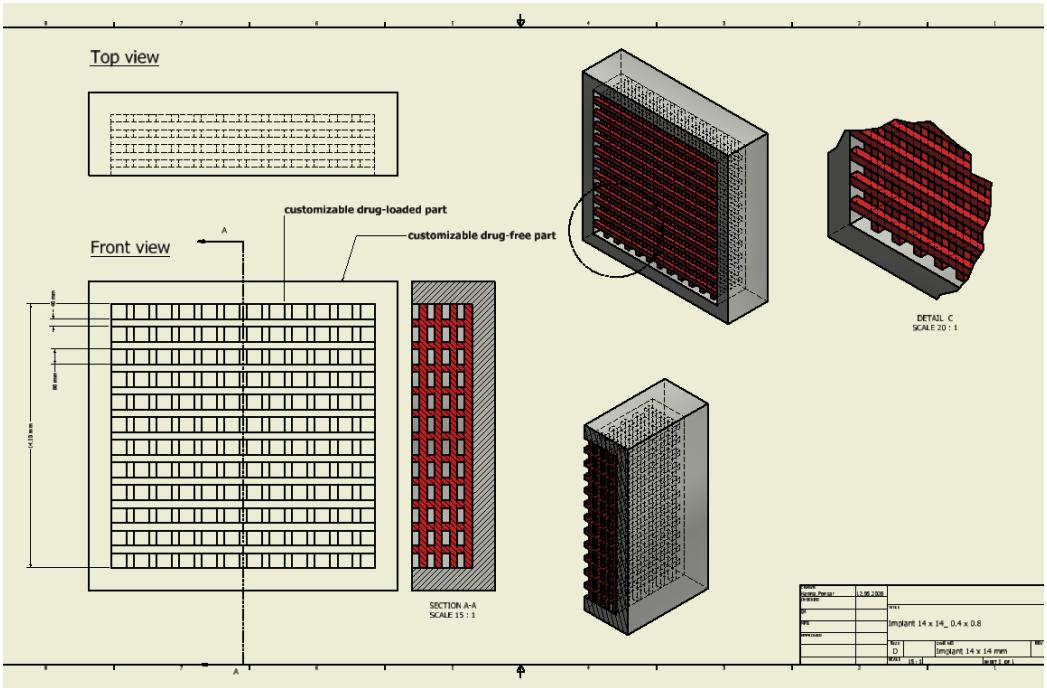

Figure S1. Technical drawing of the modular implant concept, consisting of the drug-free shell (grey) and the drug-loaded network (red).

Table S1. HME barrel temperatures and haul-off speed applied during filament production.

Formulation	Barrel temperature from zone T1 (gear) to T10 (die) [°C]										Haul-off speed [m/min]
	T1	T2	T3	T4	T5	T6	T7	T8	T9	T10	
F1, F2	-	30	80	120	170	180	180	190	190	190	2.1

Table S2. Detailed 3D-printing settings for two component implants.

Settings	Two-component implants			
	Drug-free shell	Drug-loaded network inlays		
		0.4 mm	0.8 mm	1.2 mm
Filament	F6	F12	F12	F12
Print temperature [°C]	185	185	185	185
Build plate temp. [°C]	90	90	90	90
Nozzle diameter [mm]	0.4	0.4	0.4	0.4
Layers and perimeters				
Layer height (first layer height) [mm]	0.2 (0.2)	0.2 (0.2)	0.2 (0.2)	0.2 (0.2)

Settings	Two-component implants			
	Drug-free shell	Drug-loaded network inlays		
		0.4 mm	0.8 mm	1.2 mm
Perimeters	1	0	1	1
Solid layers (top and bottom)	0	0	0	0
Seam position	nearest	nearest	nearest	nearest
Infill				
Infill density [%]	100	100	100	100
Fill pattern	rectilinear			
Fill angle [°]	45	90	90	90
Speed [mm/s]				
Perimeters	25	10	20	15
Infill	20	8	16	12
Travel	80	120	80	120
First layer	12.5	10	10	15
Others				
Extrusion width [mm]	0.39	0.39	0.4	0.4
Infill/perimeter overlap [%]	5	N/A	5	5
Ooze shield	yes	yes	yes	yes

Table S3. Exemplary true strand widths [µm] of implants networks (determined via X-ray computed tomography (n = 3)).

Implant (strand width x pore size)	Strand width (mean ± s) [µm]	Deviation from set point
0.4 x 0.4	429 ± 21	0.07
0.8 x 0.8	914 ± 37	0.13
1.2 x 1.2	1241 ± 61	0.03