

Human osteoblast and fibroblast response to oral implant biomaterials functionalized with non-thermal oxygen plasma

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Biomaterial	S_a [μm]	S_q [μm]	S_z [μm]	S_{sk} [μm]	S_{tr}	S_{dr} [%]	S_{dq}	Spd	Spc
ATZ_AO	0.68 ± 0.09	1.02 ± 0.19	14.05 ± 1.25	-0.54 ± 0.23	0.79 ± 0.06	26.17 ± 2.37	1.35 ± 0.16	0.002 ± 0.00	11.66 ± 5.05
TZP_AO	0.64 ± 0.02	1.06 ± 0.04	13.51 ± 0.12	-2.6 ± 0.04	0.77 ± 0.06	33.44 ± 0.66	1.72 ± 0.03	0.003 ± 0.00	12.29 ± 0.45
Ti_AO	1.3 ± 0.06	1.55 ± 0.06	10.17 ± 0.47	0.57 ± 0.06	0.91 ± 0.00	57.14 ± 2.83	2.13 ± 0.08	0.01 ± 0.00	8.60 ± 0.78

Supplementary Table S1: Surface parameters of the biomaterial samples for AO. Data show mean values (n=4) ± SEM.

Biomaterial	S_a [μm]	S_q [μm]	S_z [μm]	S_{sk} [μm]	S_{tr}	S_{dr} [%]	S_{dq}	Spd	Spc
ATZ_GF	0.13 ± 0.00	0.18 ± 0.00	2.84 ± 0.47	-2.08 ± 0.14	0.73 ± 0.04	1.36 ± 0.05	0.18 ± 0.01	0.003 ± 0.00	0.26 ± 0.05
TZP_GF	0.17 ± 0.02	0.24 ± 0.03	3.19 ± 0.72	-1.50 ± 0.22	0.84 ± 0.02	2.70 ± 0.40	0.27 ± 0.04	0.004 ± 0.00	0.66 ± 0.29
Ti_GF	0.14 ± 0.01	0.19 ± 0.03	3.02 ± 1.06	0.82 ± 0.88	0.12 ± 0.05	1.23 ± 0.19	0.18 ± 0.03	0.006 ± 0.00	0.66 ± 0.12

Supplementary Table S2: Surface parameters of the biomaterial samples for GF. Data show mean values (n=4) ± SEM.

	Not functionalized ± SEM	Functionalized ± SEM
ATZ_AO	75.65 ± 6,80	12.90 ± 0.59
TZP_AO	96.04 ± 3.29	0.78 ± 0.51
Ti_AO	97.43 ± 1.60	0.00 ± 0.00
ATZ_GF	72.51 ± 5.81	15.71 ± 0.96
TZP_GF	63.86 ± 4.41	12.34 ± 0.40
Ti_GF	65.43 ± 3.94	7.94 ± 0.84

Supplementary Table S3: Contact angles of plasma-functionalized and control surfaces for AO and GF. Data show mean values (n=8) ± SEM.

Biomaterial	cell area [μm^2]		perimeter [μm]		aspect ratio		roundness		circularity	
	day 1	day 3	day 1	day 3	day 1	day 3	day 1	day 3	day 1	day 3
ATZ_AO	1813 $\pm$ 72	1755 $\pm$ 96	204 $\pm$ 6	201 $\pm$ 7	2.06 $\pm$ 0.07	2.23 $\pm$ 0.09	0.16 $\pm$ 0.00	0.15 $\pm$ 0.00	0.58 $\pm$ 0.01	0.58 $\pm$ 0.01
ATZ_AO_p	1724 $\pm$ 78	1564 $\pm$ 83	204 $\pm$ 6	180 $\pm$ 6	2.34 $\pm$ 0.09	2.01 $\pm$ 0.07	0.14 $\pm$ 0.00	0.16 $\pm$ 0.00	0.55 $\pm$ 0.01	0.62 $\pm$ 0.01
Y-TZP_AO	1726 $\pm$ 59	1606 $\pm$ 67	206 $\pm$ 5	222 $\pm$ 8	2.39 $\pm$ 0.08	2.53 $\pm$ 0.09	0.14 $\pm$ 0.00	0.13 $\pm$ 0.00	0.55 $\pm$ 0.01	0.48 $\pm$ 0.01
Y-TZP_AO_p	1775 $\pm$ 64	1810 $\pm$ 84	207 $\pm$ 5	213 $\pm$ 7	2.41 $\pm$ 0.08	2.55 $\pm$ 0.10	0.14 $\pm$ 0.00	0.13 $\pm$ 0.00	0.55 $\pm$ 0.01	0.54 $\pm$ 0.01
Ti_AO	1701 $\pm$ 44	1581 $\pm$ 72	241 $\pm$ 6	224 $\pm$ 9	2.59 $\pm$ 0.08	2.62 $\pm$ 0.09	0.11 $\pm$ 0.00	0.11 $\pm$ 0.00	0.43 $\pm$ 0.01	0.46 $\pm$ 0.01
Ti_AO_p	1826 $\pm$ 47	1440 $\pm$ 63	236 $\pm$ 5	216 $\pm$ 8	2.53 $\pm$ 0.07	2.7 $\pm$ 0.10	0.12 $\pm$ 0.00	0.12 $\pm$ 0.00	0.47 $\pm$ 0.01	0.49 $\pm$ 0.02

Supplementary Table S4: Morphometric data of AO morphology after 1 and 3 days. Data are listed as mean values $\pm$ SEM (194<n<373).

Biomaterial	cell area [μm^2]		perimeter [μm]		aspect ratio		roundness		circularity	
	day 1	day 3	day 1	day 3	day 1	day 3	day 1	day 3	day 1	day 3
ATZ_GF	2435 $\pm$ 130	2526 $\pm$ 195	309 $\pm$ 13	283 $\pm$ 15	3.82 $\pm$ 0.20	3.35 $\pm$ 0.18	0.09 $\pm$ 0.01	0.10 $\pm$ 0.01	0.41 $\pm$ 0.02	0.44 $\pm$ 0.02
ATZ_GF_p	2126 $\pm$ 111	2697 $\pm$ 226	253 $\pm$ 9	286 $\pm$ 14	3.41 $\pm$ 0.18	3.22 $\pm$ 0.15	0.11 $\pm$ 0.01	0.10 $\pm$ 0.00	0.47 $\pm$ 0.02	0.43 $\pm$ 0.02
Y-TZP_GF	2597 $\pm$ 156	1692 $\pm$ 109	320 $\pm$ 12	213 $\pm$ 9	3.67 $\pm$ 0.18	2.60 $\pm$ 0.10	0.09 $\pm$ 0.00	0.13 $\pm$ 0.00	0.36 $\pm$ 0.01	0.54 $\pm$ 0.01
Y-TZP_GF_p	1881 $\pm$ 73	2013 $\pm$ 129	253 $\pm$ 8	239 $\pm$ 10	3.23 $\pm$ 0.11	2.68 $\pm$ 0.10	0.10 $\pm$ 0.00	0.12 $\pm$ 0.00	0.44 $\pm$ 0.01	0.51 $\pm$ 0.01
Ti_GF	2808 $\pm$ 114	2098 $\pm$ 109	348 $\pm$ 10	271 $\pm$ 10	4.13 $\pm$ 0.16	3.65 $\pm$ 0.14	0.07 $\pm$ 0.00	0.11 $\pm$ 0.01	0.33 $\pm$ 0.01	0.44 $\pm$ 0.01
Ti_GF_p	2372 $\pm$ 119	1933 $\pm$ 104	304 $\pm$ 13	259 $\pm$ 10	3.83 $\pm$ 0.19	3.50 $\pm$ 0.12	0.09 $\pm$ 0.01	0.10 $\pm$ 0.00	0.41 $\pm$ 0.02	0.45 $\pm$ 0.02

Supplementary Table S5: Morphometric data of GF morphology after 1 and 3 days. Data are listed as mean values $\pm$ SEM (145<n<300).

	AB reduction [%]			Cell number		
	day 1	day 3	day 7	day 1	day 3	day 7
ATZ AO	2.35±0.5	3.90±0.8	13.15±3.5	24±6	46±8	81±24
ATZ AO_p	2.04±0.3	3.42±0.5	11.42±2.0	16±2	65±10	105±34
Y-TZP AO	2.27±0.4	3.84±0.5	11.89±2.0	22±16	39±5	125±8
Y-TZP AO_p	2.00±0.3	3.23±0.4	10.91±1.6	26±3	51±8	107±19
Ti AO	2.37±0.5	3.83±0.7	10.01±2.0	33±3	51±6	101±14
Ti AO_p	1.93±0.3	3.31±0.3	9.51±1.5	29±3	45±6	147±16

Supplementary Table S6: Metabolic activity and number of attached AO. Data are listed as mean values ± SEM (n=6).

	AB reduction [%]			Cell number		
	day 1	day 3	day 7	day 1	day 3	day 7
ATZ GF	1.98±0.1	4.70±0.2	10.93±0.8	16±2	33±5	97±7
ATZ GF_p	1.6±0.1	4.22±0.2	9.53±0.4	26±4	33±6	67±8
Y-TZP GF	2.05±0.1	4.89±0.3	10.58±0.7	20±2	40±4	114±8
Y-TZP GF_p	1.63±0.1	4.21±0.1	9.36±0.2	20±2	37±5	90±13
Ti GF	1.88±0.1	4.42±0.3	9.80±0.7	23±2	42±5	131±12
Ti GF_p	1.61±0.1	4.30±0.3	9.69±0.3	20±3	51±9	70±8

Supplementary Table S7: Metabolic activity and number of attached GF. Data are listed as mean values ± SEM (n=6).