ELECTRONIC SUPPLEMENTAL MATERIAL

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The way wear goes – phytolith-based wear on the dentine-enamel system in guinea pigs (*Cavia porcellus*)

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Table S1. Morphometric measurements performed on mCT of guinea pigs (*Cavia porcellus)* fed diets of different phytolith concentration for three weeks. One-way ANOVA comparing body size measures across diet treatments.

		Lucerne		Grass		Bamboo		ANOVA	
		fresh	dry	fresh	dry	fresh	dry	$F_{5,30}$	p
Body mass									
start	g	259 ±15	265 ±15	259 ±17	261 ±13	267 ±12	269 ±17	0.496	0.777
day 10	g	300 ±17	319 ±7	331 ±14	303 ±12	282 ±14	253 ±15		
end	g	353 ±27^{a}	349 ±21^{a}	365 ±25^{a}	360 ±14^{a}	292 ±13^{b}	274 ±21^{b}	20.777	<0.001
Skull measurements									
width	mm	28.6 ±0.2	28.7 ±0.7	28.9 ±0.6	28.7 ±0.2	27.9 ±0.7	28.2 ±0.8	2.125	0.090
length*	mm	25.4 ±0.7^{ab}	26.2 ±0.7^{a}	25.6 ±0.6^{ab}	25.6 ±0.6^{ab}	25.3 ±0.4^{ab}	25.2 ±1.2^{b}	2.869	0.031
Tooth row length									
LL	mm	12.9 ±0.6	13.3 ±0.8	13.6 ±0.5	13.5 ±0.5	13.6 ±0.5	13.5 ±0.4	1.419	0.246
LR	mm	13.1 ±0.6	13.0 ±0.6	13.5 ±0.7	13.2 ±0.4	13.6 ±0.3	13.3 ±0.4	0.994	0.438
UL	mm	12.7 ±0.6^{ab}	12.5 ±0.5^{b}	12.9 ±0.3^{ab}	12.7 ±0.4^{b}	13.4 ±0.5^{ab}	13.4 ±0.3^{a}	5.378	<0.001
UR	mm	12.6 ±0.6^{bc}	12.4 ±0.3^{b}	13.0 ±0.2^{ac}	12.7 ±0.3^{bc}	13.3 ±0.3^{ac}	13.4 ±0.3^{ac}	8.094	<0.001
Occlusal area									
Total	mm^2	95.5 ±2.9^{b}	93.1 ±4.6^{b}	99.0 ±3.2^{b}	95.9 ±.3.9^{b}	115.7 ±3.4^{a}	115.0 ±2.1^{a}	54.130	<0.001

^{a,b,c} Within lines, means with different superscripts differ significantly in post hoc-testing.

Skull width = distance zygomatic arches

Skull length = length of hard palate

LL lower left, LR lower right, UL upper left, UL upper right jaw

* ranked data

Table S2. Measurements as mean ± standard deviation in mCT for incisors of guinea pigs (*Cavia porcellus)* fed for three weeks with lucerne, grass or bamboo either dry or fresh. Results of nested GLM are given without control for body mass as a function of diet, and fresh/dry nature of diet (FD). Models without interactions are presented in cases where interaction term was not significant.

		Lucerne		Grass		Bamboo		Effect			
		fresh	dry	fresh	dry	fresh	dry		jaw	diet	fresh/dry
Rostral height											
UL	mm	19.7 ±0.5	20.5 ±0.3	19.9 ±0.4	19.4 ±0.4	18.8 ±0.7	18.9 ±0.2	p	<0.001	<0.001	0.409
UR	mm	19.8 ±0.5	20.4 ±0.4	20 ±0.6	19.2 ±0.5	19.1 ±0.6	18.9 ±0.3				
LL	mm	24.7 ±0.7	24.7 ±0.6	24.6 ±0.8	23.8 ±0.4	23.7 ±0.3	23.9 ±0.6	post-hoc	L>U	Lucerne>Bamboo UL: Grass>Bamboo	n.s.
LR	mm	25 ±0.4	24.8 ±0.9	24.8 ±0.7	23.8 ±0.3	23.8 ±0.4	24.2 ±0.4				
Caudal height											
UL	mm	13.7 ±0.4	14 ±0.3	13.4 ±0.2	13.1 ±0.2	12.4 ±0.7	12.4 ±0.5	p	<0.001	<0.001	0.493
UR	mm	13.5 ±0.4	14 ±0.3	13.4 ±0.3	12.9 ±0.4	12.8 ±0.6	12.7 ±0.3				
LL	mm	18.8 ±0.5	19 ±0.3	19.3 ±0.6	18.3 ±0.5	18.2 ±0.5	18.2 ±0.6	post-hoc	L>U	UL: Lucerne/Grass >Bamboo UR: Lucerne>Bamboo	n.s.
LR	mm	18.8 ±0.6	19 ±0.8	18.7 ±0.7	18.1 ±0.5	18.2 ±0.8	18.4 ±0.6				
Functional crown											
UL	mm	1.44 ±0.21	1.65 ±0.30	1.35 ±0.29	1.19 ±0.28	1.06 ±0.23	1.04 ±0.15	p	0.092	<0.001	0.424
UR	mm	1.71 ±0.52	1.57 ±0.25	1.4 ±0.32	1.33 ±0.29	1.31 ±0.26	1.15 ±0.27	post-hoc	n.s.	Lucerne>Bamboo	n.s.

Post hoc results displayed as each group separated by commas, within which if specified effect is not shown then "all groups" must be assumed, e.g. LR, LL P4; U=upper jaw; ; L=lower jaw; UL/LL=upper or lower left jaw; UR/LR=upper or lower right jaw;
n.s = not significant

Table S3. Measurements as mean ± standard deviation in mCT for the premolars (P4) of guinea pigs (*Cavia porcellus)* fed for three weeks with lucerne, grass or bamboo either dry or fresh.

			Lucerne		Grass		Bamboo	
			fresh	dry	fresh	dry	fresh	dry
Premolar								
Buccal height	LL	mm	9.8 ±0.4	10.6 ±0.5	10.7 ±0.4	10.0 ±0.5	9.6 ±0.4	9.1 ±0.4
	LR		10.2 ±0.4	10.1 ±0.5	10.7 ±0.4	9.7 ±0.3	9.6 ±0.2	9.4 ±0.5
	UL		7.9 ±0.2	8.0 ±0.4	7.7 ±0.3	8.1 ±0.3	6.7 ±0.4	6.4 ±0.5
	UR		7.8 ±0.2	8.0 ±0.4	7.7 ±0.4	7.7 ±0.3	6.6 ±0.2	6.4 ±0.5
Lingual height	LL	mm	9.0 ±0.1	8.9 ±0.4	9.0 ±0.2	8.5 ±0.2	8.4 ±0.1	8.2 ±0.2
	LR		8.9 ±0.5	8.9 ±0.4	9.0 ±0.3	8.5 ±0.2	8.4 ±0.3	8.3 ±0.4
	UL		12.4 ±0.8	12.6 ±0.3	12.7 ±0.5	12.6 ±0.3	10.9 ±0.5	10.6 ±0.4
	UR		12.5 ±0.6	12.9 ±0.2	12.7 ±0.4	12.5 ±0.6	10.9 ±0.5	10.6 ±0.5
Basin depth	LL	mm	0.102 ±0.029	0.143 ±0.069	0.155 ±0.029	0.107 ±0.034	0.305 ±0.060	0.217 ±0.021
	LR		0.077 ±0.010	0.105 ±0.056	0.130 ±0.030	0.115 ±0.026	0.260 ±0.028	0.208 ±0.030
	UL		0.078 ±0.020	0.095 ±0.043	0.158 ±0.036	0.228 ±0.061	0.272 ±0.058	0.145 ±0.037
	UR		0.087 ±0.018	0.177 ±0.094	0.178 ±0.029	0.238 ±0.086	0.257 ±0.059	0.155 ±0.030
Occlusal area	LL	mm^2	4.97 ±0.33	4.93 ±0.41	38.1 ±2.6	4.88 ±0.22	5.84 ±0.26	6.08 ±0.27
	LR		4.82 ±0.40	4.71 ±0.22	5.19 ±0.23	4.97 ±0.26	5.94 ±0.39	6.10 ±0.22
	UL		6.20 ±0.41	5.86 ±0.26	5.16 ±0.32	6.04 ±0.21	7.29 ±0.37	7.10 ±0.30
	UR		6.15 ±0.59	5.76 ±0.22	6.44 ±0.34	5.98 ±0.50	7.58 ±0.44	7.48 ±0.61
Occlusal angle	UR	°	33.7 ±5.3	34.1 ±5.6	38.1 ±2.6	36.6 ±5.1	26.5 ±5.0	20.3 ±11.1

LL lower left, LR lower right, UL upper left, UL upper right jaw

Table S4. Measurements as mean ± standard deviation in mCT for the first molars of guinea pigs (*Cavia porcellus)* fed for three weeks with lucerne, grass or bamboo either dry or fresh.

			Lucerne		Grass		Bamboo	
First molar			fresh	dry	fresh	dry	fresh	dry
Buccal height	LL	mm	9.9 ±0.3	10.3 ±0.3	10.4 ±0.3	9.9 ±0.3	9.3 ±0.3	9.0 ±0.3
	LR		9.8 ±0.4	10.1 ±0.5	10.3 ±0.3	9.7 ±0.2	9.2 ±0.2	9.1 ±0.3
	UL		7.9 ±0.2	8.2 ±0.3	7.9 ±0.4	8.1 ±0.2	6.9 ±0.2	6.8 ±0.2
	UR		8.0 ±0.2	8.3 ±0.4	7.9 ±0.3	7.8 ±0.2	7.1 ±0.3	7.0 ±0.3
Lingual height	LL	mm	8.5 ±0.3	8.7 ±0.2	8.4 ±0.3	8.3 ±0.2	7.9 ±0.2	7.9 ±0.3
	LR		8.4 ±0.3	8.7 ±0.3	8.4 ±0.3	8.1 ±0.3	7.9 ±0.1	7.9 ±0.2
	UL		12.3 ±0.7	12.3 ±0.4	12.4 ±0.3	12.1 ±0.1	10.9 ±0.6	10.5 ±0.4
	UR		12.2 ±0.4	12.7 ±0.1	12.4 ±0.4	12.2 ±0.2	10.8 ±0.5	10.7 ±0.5
Basin depth	LL	mm	0.095 ±0.010	0.113 ±0.046	0.135 ±0.042	0.157 ±0.038	0.317 ±0.033	0.275 ±0.026
	LR		0.078 ±0.023	0.105 ±0.024	0.132 ±0.044	0.125 ±0.031	0.315 ±0.039	0.240 ±0.043
	UL		0.090 ±0.019	0.133 ±0.040	0.147 ±0.044	0.195 ±0.021	0.273 ±0.016	0.247 ±0.033
	UR		0.087 ±0.035	0.142 ±0.036	0.137 ±0.073	0.193 ±0.040	0.280 ±0.027	0.243 ±0.014
Occlusal area	LL	mm^2	6.04 ±0.32	5.79 ±0.39	6.34 ±0.41	6.06 ±0.37	6.99 ±0.32	7.22 ±0.30
	LR		5.95 ±0.18	5.82 ±0.33	6.18 ±0.42	6.14 ±0.39	7.09 ±0.28	7.36 ±0.22
	UL		5.62 ±0.21	5.61 ±0.29	5.71 ±0.35	5.55 ±0.15	6.77 ±0.32	6.62 ±0.25
	UR		5.55 ±0.12	5.33 ±0.24	5.72 ±0.30	5.57 ±0.16	6.88 ±0.42	6.62 ±0.18
Occlusal angle	UR	°	34.8 ±4.0	35.5 ±4.0	36.3 ±2.6	36.5 ±4.4	30.4 ±2.1	21.5 ±10.6

LL lower left, LR lower right, UL upper left, UL upper right jaw

Table S5. Measurements as mean ± standard deviation in mCT for the second molars of guinea pigs (*Cavia porcellus)* fed for three weeks with lucerne, grass or bamboo either dry or fresh.

			Lucerne		Grass		Bamboo	
Second molar			fresh	dry	fresh	dry	fresh	dry
Buccal height	LL	mm	9.5 ±0.4	9.8 ±0.3	9.7 ±0.3	9.4 ±0.3	8.8 ±0.1	8.5 ±0.3
	LR		9.4 ±0.5	9.7 ±0.4	9.6 ±0.3	9.2 ±0.2	8.8 ±0.3	8.5 ±0.5
	UL		7.7 ±0.1	7.9 ±0.2	7.6 ±0.3	7.7 ±0.2	7.1 ±0.3	6.6 ±0.3
	UR		7.8 ±0.4	7.9 ±0.2	7.6 ±0.2	7.7 ±0.1	7.1 ±0.3	7.0 ±0.4
Lingual height	LL	mm	8.3 ±0.3	8.6 ±0.3	8.4 ±0.3	8.2 ±0.2	7.6 ±0.3	7.6 ±0.4
	LR		8.4 ±0.3	8.6 ±0.3	8.6 ±0.3	8.1 ±0.4	7.7 ±0.2	7.6 ±0.4
	UL		10.7 ±0.3	10.8 ±0.3	10.8 ±0.4	10.4 ±0.3	9.8 ±0.3	9.3 ±0.4
	UR		10.5 ±0.2	10.9 ±0.1	10.4 ±0.4	10.4 ±0.1	9.5 ±0.4	9.4 ±0.6
Basin depth	LL	mm	0.078 ±0.029	0.087 ±0.029	0.115 ±0.041	0.125 ±0.023	0.307 ±0.032	0.247 ±0.036
	LR		0.087 ±0.020	0.105 ±0.027	0.093 ±0.034	0.122 ±0.028	0.267 ±0.056	0.253 ±0.037
	UL		0.063 ±0.024	0.080 ±0.033	0.127 ±0.037	0.162 ±0.080	0.252 ±0.033	0.288 ±0.035
	UR		0.077 ±0.027	0.108 ±0024	0.113 ±0.037	0.153 ±0.042	0.263 ±0.025	0.298 ±0.055
Occlusal area	LL	mm^2	6.52 ±0.47	6.22 ±0.44	6.43 ±0.24	6.37 ±0.37	7.59 ±0.50	7.70 ±0.26
	LR		6.51 ±0.37	6.30 ±0.23	6.68 ±0.31	6.49 ±0.24	7.62 ±0.44	7.85 ±0.53
	UL		5.50 ±0.39	5.37 ±0.39	5.80 ±0.35	5.54 ±0.38	6.78 ±0.28	6.54 ±0.23
	UR		5.53 ±0.19	5.34 ±0.39	5.79 ±0.23	5.63 ±0.32	6.98 ±0.47	6.70 ±0.31
Occlusal angle	UR	°	33.7 ±2.9	35.6 ±1.9	37.2 ±1.6	36.7 ±3.2	34.4 ±2.2	27.2 ±13.4

LL lower left, LR lower right, UL upper left, UL upper right jaw

Table S6. Measurements as mean ± standard deviation in mCT for the third molars of guinea pigs (*Cavia porcellus)* fed for three weeks with lucerne, grass or bamboo either dry or fresh.

			Lucerne		Grass		Bamboo	
Third molar			fresh	dry	fresh	dry	fresh	dry
Buccal height	LL	mm	7.8 ±0.3	8.1 ±0.4	7.9 ±0.3	7.7 ±0.1	7.2 ±0.4	7.0 ±0.3
	LR		7.7 ±0.4	7.8 ±0.4	7.9 ±0.2	7.5 ±0.2	7.2 ±0.2	7.1 ±0.3
	UL		7.3 ±0.1	7.5 ±0.2	7.4 ±0.2	7.2 ±0.2	6.7 ±0.2	6.4 ±0.3
	UR		7.3 ±0.4	7.7 ±0.2	7.2 ±0.1	7.2 ±0.3	6.7 ±0.2	6.4 ±0.4
Lingual height	LL	mm	7.8 ±0.2	7.9 ±0.4	7.6 ±0.4	7.1 ±0.3	6.9 ±0.3	6.8 ±0.1
	LR		7.8 ±0.3	8.0 ±0.2	7.7 ±0.1	7.3 ±0.5	6.8 ±0.4	6.9 ±0.3
	UL		8.5 ±0.3	8.7 ±0.3	8.5± 0.2	8.6 ±0.3	7.7 ±0.2	7.6 ±0.4
	UR		8.5 ±0.2	9.0 ±0.3	8.6 ±0.2	8.5 ±0.4	8.0 ±0.5	7.4 ±0.7
Basin depth	LL	mm	0.118 ±0.034	0.115 ±0.055	0.127 ±0.027	0.135 ±0.024	0.272 ±0.015	0.198 ±0.054
	LR		0.073 ±0.033	0.078 ±0.053	0.100 ±0.052	0.123 ±0.016	0.230 ±0.029	0.208 ±0.035
	UL		0.080 ±0.024	0.082 ±0.023	0.105 ±0.018	0.090 ±0.026	0.198 ±0.055	0.243 ±0.055
	UR		0.085 ±0.063	0.090 ±0.018	0.103 ±0.024	0.113 ±0.112	0.205 ±0.036	0.243 ±0.040
Occlusal area	LL	mm^2	6.93 ±0.52	6.55 ±0.55	6.81 ±0.35	6.87 ±0.40	8.31 ±0.34	8.02 ±0.31
	LR		6.84 ±0.60	6.99 ±0.52	6.97 ±0.22	6.84 ±0.33	8.17 ±0.32	8.11 ±0.46
	UL		6.19 ±0.30	6.36 ±0.35	6.74 ±0.25	6.47 ±0.31	7.71 ±0.63	7.78 ±0.29
	UR		6.22 ±0.34	6.15 ±0.35	6.74 ±0.21	6.46 ±0.39	8.19 ±0.31	7.76 ±0.37
Occlusal angle	UR	°	35.3 ±3.8	37.4 ±2.4	37.5 ±2.4	37.3 ±1.2	38.4 ±1.0	30.2 ±15.0

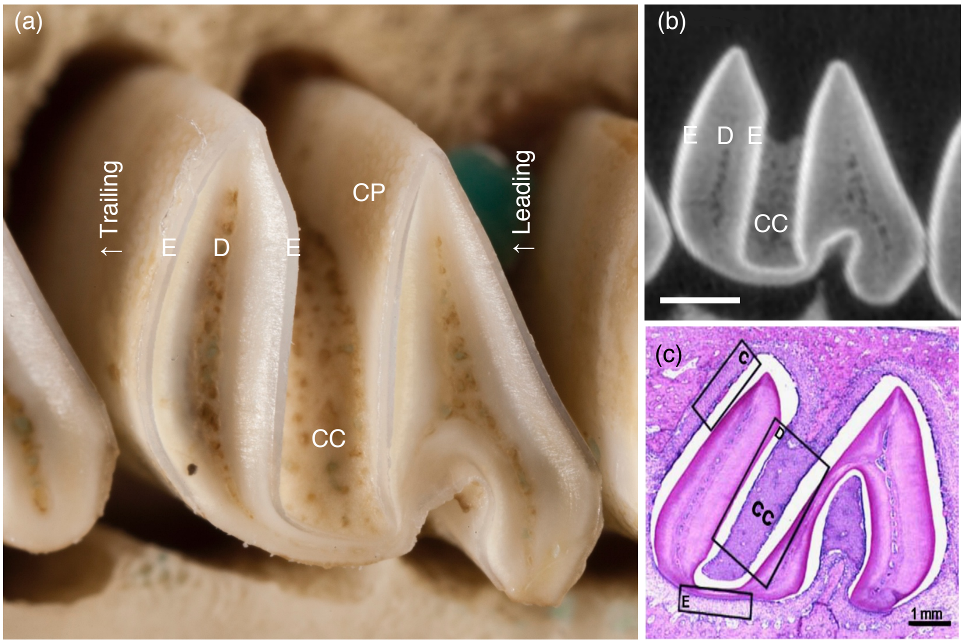
LL lower left, LR lower right, UL upper left, UL upper right jaw

Table S7. Analysis of tooth measurements in mCT for the cheek teeth of guinea pigs (*Cavia porcellus)* fed for three weeks with lucerne, grass or bamboo either dry or fresh. Results of nested GLM are given without control for body mass as a function of diet, and fresh/dry nature of diet (FD). Models without interactions are presented in cases where interaction term was not significant.

Variable	Model structure	Effect	df	F	p	posthoc
Cheek teeth						
TH buccal	Jaw/Tooth/(Diet+FD+Diet*FD)	Jaw	3.480	1362.812	<0.001	L>U
		Tooth	12.480	206.727	<0.001	L: M3>M2>P4/M1; U: M3>M1/M2/P4; UR: M1>P4
		Diet	32.480	33.661	<0.001	Lucerne/Grass>Bamboo
		FD	16.480	1.679	0.047	n.s.
		Diet*FD	32.480	4.037	<0.001	LR P4 G: F>D
TH lingual*	Jaw/Tooth/(Diet+FD+Diet*FD)	Jaw	3.480	1257.870	<0.001	L>U
		Tooth	12.480	232.648	<0.001	L: P4>M1>M2/M3; U: P4/M1>M2>M3
		Diet	32.480	26.424	<0.001	Lucerne/Grass>Bamboo (except U, M2; Grass=Bamboo in U, M2, M3)
		FD	16.480	1.938	0.016	n.s.
		Diet*FD	32.480	2.809	<0.001	LR M2 G: F>D
Basin depth*	Jaw/Tooth/(Diet+FD+Diet*FD)	Jaw	3.479	5.367	<0.001	UR/LL>LR
		Tooth	12.479	5.560	<0.001	P4/M1>M3
		Diet	32.479	44.440	<0.001	Bamboo>Lucerne/Grass (U P4: Bamboo=Grass); UL M1 M2 P4, UR P4: Grass>Lucerne
		FD	16.479	2.172	<0.001	n.s.
		Diet*FD	32.479	3.450	<0.001	n.s.
Occlusal angle*	Tooth/(Diet+FD)	Tooth	3.128	8.828	<0.001	M3>M1/M2/P4
		Diet	8.128	8.914	<0.001	P4 M1: Lucerne/Grass>Bamboo; M2: Grass>Bamboo
		FD	4.128	0.528	0.715	n.s.
Occlusal area	Jaw/Tooth/(Diet+FD)	Jaw	3.512	7.184	<0.001	L>U
		Tooth	12.512	136.375	<0.001	L: M3>M2>M1>P4; U: M3>M1/M2>P4
		Diet	32.512	50.100	<0.001	Bamboo>Lucerne/Grass
		FD	16.512	2.018	0.011	n.s.
Total occlusal area*	Jaw/(Diet+FD+Diet*FD)	Jaw	3.552	14.218	<0.001	L>U
		Diet	8.552	197.822	<0.001	Bamboo>Lucerne/Grass (except in LL)
		FD	4.552	11.629	<0.001	U: F>D
		Diet*FD	8.552	2.462	0.013	U G: F>D

post hoc results displayed as each group separated by commas, within which if specified effect is not shown then "all groups" must be assumed, e.g. LR, LL P4; U=upper jaw; L=lower jaw; UL/LL=upper or lower left jaw; UR/LR=upper or lower right jaw;
* ranked data

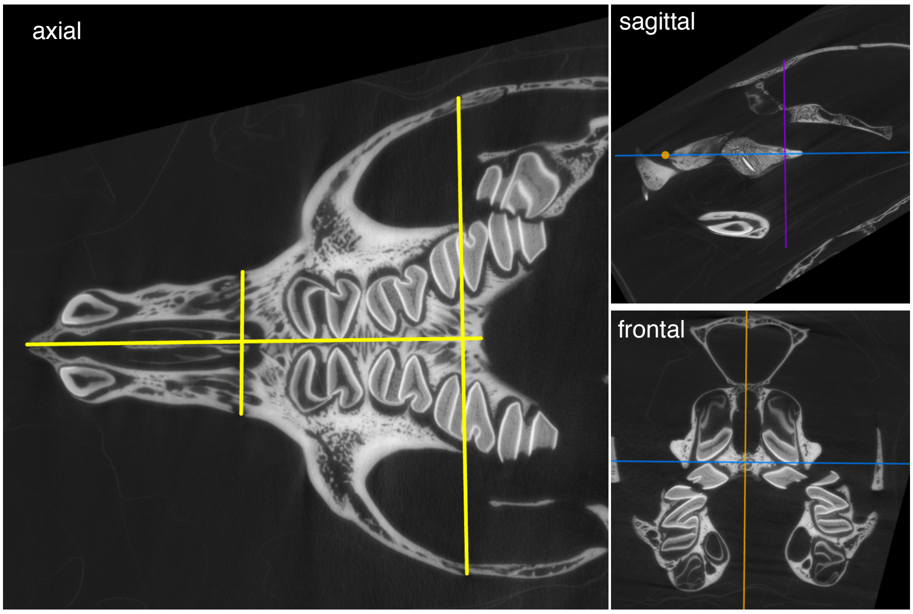
Figure S1. Figure illustrating the different structures of a guinea pig (*Cavia porcellus*) molar. (a) Macroscopic photograph of M1 of a guinea pig fed exclusively with bamboo for 3 weeks and (b) the corresponding mCT slice image (white bar indicating 1mm). (c) Histological cross-section of m2 available from Moriyama, Sahara [1]. The occlusal surface represents a composite structure of enamel (E), dentine (D) and cementum. Note thicker enamel on the trailing edge [2], the cartilage-like cementum (CC) between the two lophs (indicated by "cc" in figure S1(c)) and the cementum pearls (CP) on the enamel surface.



STANDARDIZED MEASUREMENT PROCEDURES

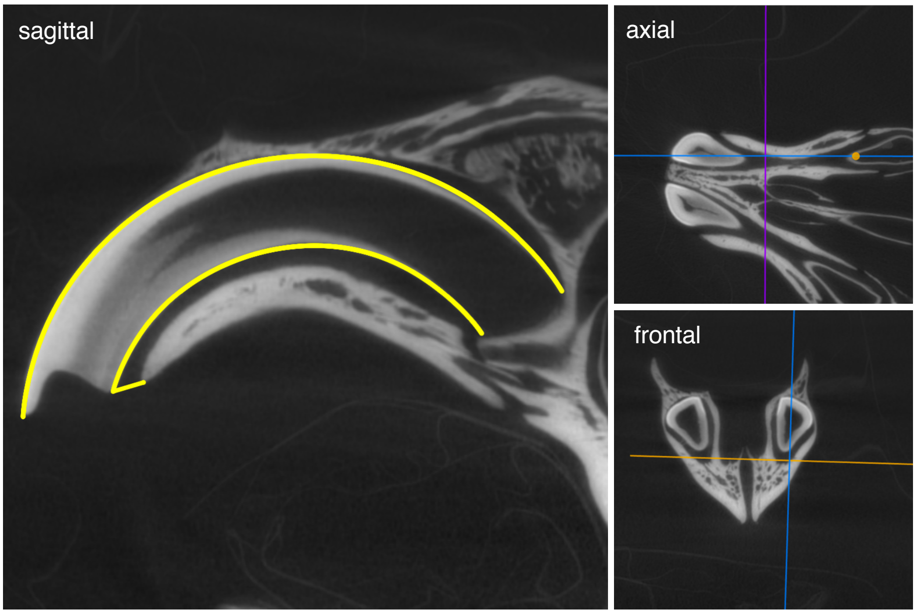
In the following figures and their legends, the procedures used for taking the various measurements are described. It must be noted that for each individual measurement, a structure (skull, tooth) was aligned individually according to the described procedures.
This means that each figure should only be used to understand the measurement the legend refers to.
Due to the three-dimensional structure of the skull and teeth, any image not specifically aligned for a certain structure can yield a misleading visual impression. For example, one cannot use figure S2 to assess the surface of the cheek teeth, because the main image does not depict their surface but an oblique plane intersecting the teeth at undefined locations (but is aligned to facilitate the correct measurement of the length and width measurements of the skull).
Readers who want to perform their own manipulations of a mCT 3D reconstruction can contact the first or last author to receive a full image dataset.

Figure S2. mCT scan of a guinea pig (*Cavia porcellus)* fed for three weeks with fresh bamboo (BF) for illustration of morphometric skull measurements. Axial plane (aligned through the base of the hard palate to the most anterior point of the *Os nasale*) with measurements for length of the hard palate, width *Os nasale*, width *Os zygomaticus*. Note that the width of the *Os zygomaticus* is defined as the distance between the *suturae* of the maxilla and the zygomatic process.



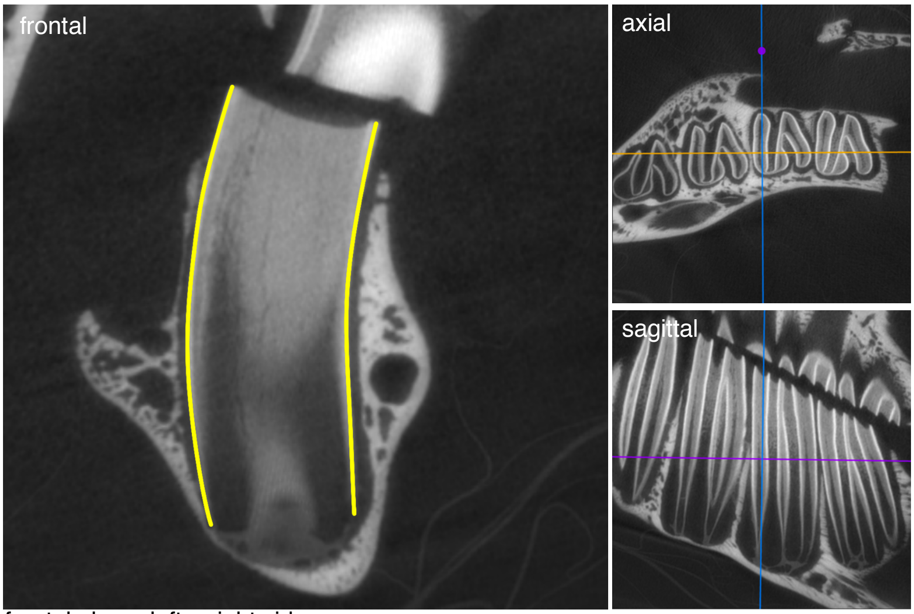
axial plane: left = rostral, up = right side
sagittal plane: left = rostral
frontal plane: left = right side
thick yellow line = measurements
alignment lines: blue line = axial plane, orange line = sagittal plane, purple line = frontal plane

Figure S3. mCT scan of a guinea pig (*Cavia porcellus)* fed for three weeks with fresh bamboo (BF) for illustration of measurements of the incisors. Sagittal plane (blue line, aligned trough the root and the crown of the upper left incisor) with measurements for curved rostral and caudal height as well as functional crown height.



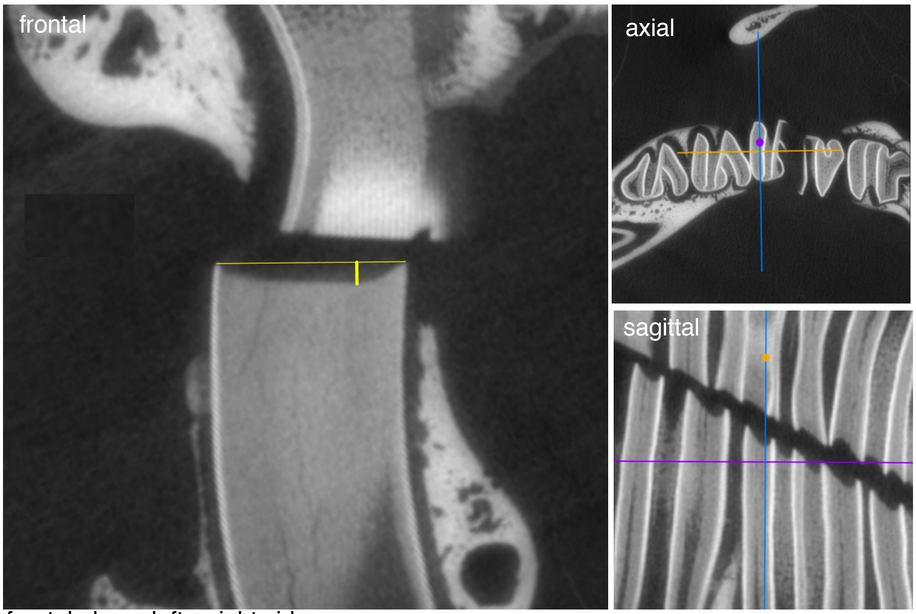
axial plane: left = rostral, up = right side
sagittal plane: left = rostral
frontal plane: left = right side
thick yellow line = measurements
alignment lines: blue line = axial plane, orange line = sagittal plane, purple line = frontal plane

Figure S4. mCT scan of a guinea pig (*Cavia porcellus)* fed for three weeks with fresh bamboo (BF) for illustration of measurements of the height cheek teeth (shown on LR m2). Frontal plane (aligned through the anteroloph) with measurements for curved buccal and lingual height.



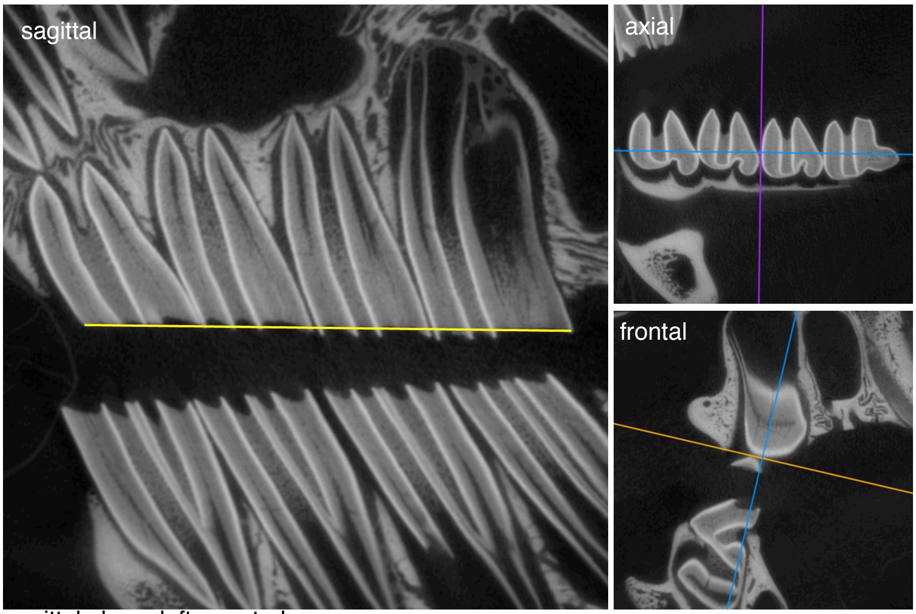
frontal plane: left = right side
axial plane: left = rostral
sagittal plane: left = rostral
thick yellow line = measurements
alignment lines: blue line = frontal plane, orange line = sagittal plane, purple line = axial plane

Figure S5. mCT scan of a guinea pig (*Cavia porcellus)* fed for three weeks with fresh bamboo (BF) for illustration of measurements of depth of the dentine basin (shown on LR m2). Frontal plane (aligned through the deepest point of the anteroloph) with measurements for the depth of the dentine base. Note the auxiliary line (thin yellow) to determine the top of the basin. On the sagittal plane, one can discern that maximum wear in the dentine (and also the cementum) basins is close to the trailing enamel ridge of the anteroloph, and that this pattern is juxtaposed in the lower and upper dentition because of the inverse arrangement of leading and trailing edges that follows from the proal chewing stroke.



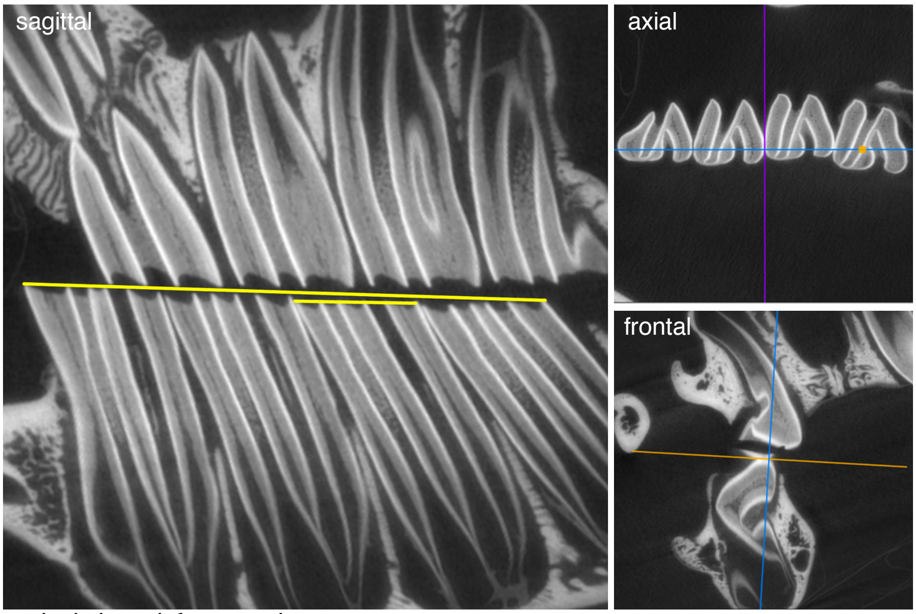
frontal plane: left = right side
axial plane: left = rostral
sagittal plane: left = rostral
thick yellow line = measurements
alignment lines: blue line = frontal plane, orange line = sagittal plane, purple line = axial plane

Figure S6a. mCT scan of a guinea pig (*Cavia porcellus)* fed for three weeks with fresh bamboo (BF) for illustration of measurements of maxillary tooth (row) length (shown on UR for tooth row length). Sagittal aligned to maximum length of tooth row.



sagittal plane: left = rostral
frontal plane: left = right side
axial plane: left = rostral
thick yellow line = measurements
alignment lines: blue line = sagittal plane, orange line = axial plane, purple line = frontal plane

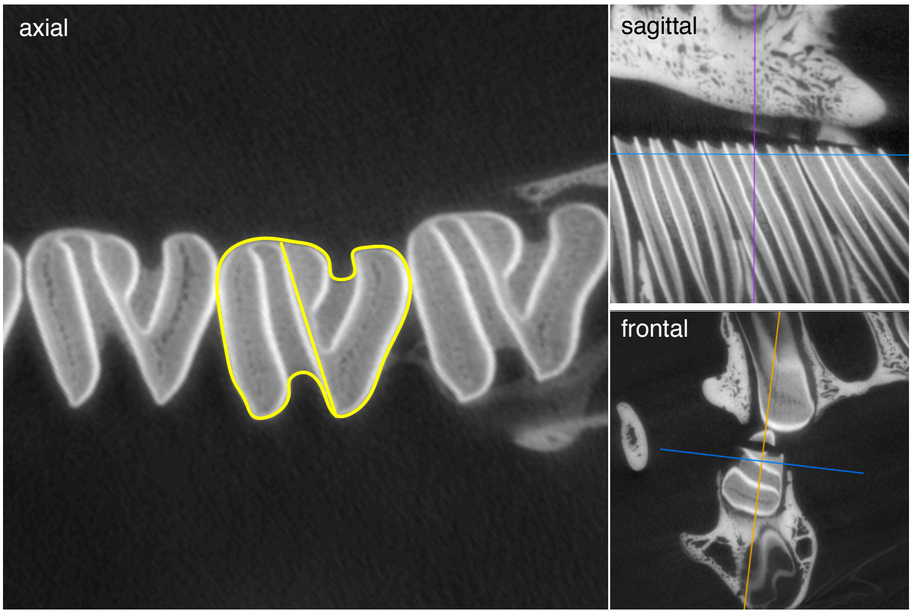
Figure S6b. mCT scan of a guinea pig (*Cavia porcellus)* fed for three weeks with fresh bamboo (BF) for illustration of measurements of mandibular tooth (row) length (shown on LR m2 for individual tooth and for LR for tooth row length). Sagittal aligned to maximum length of tooth row.



sagittal plane: left = rostral
frontal plane: left = right side
axial plane: left = rostral, up = right side
thick yellow line = measurements
alignment lines: blue line = sagittal plane, orange line = axial plane, purple line = frontal plane

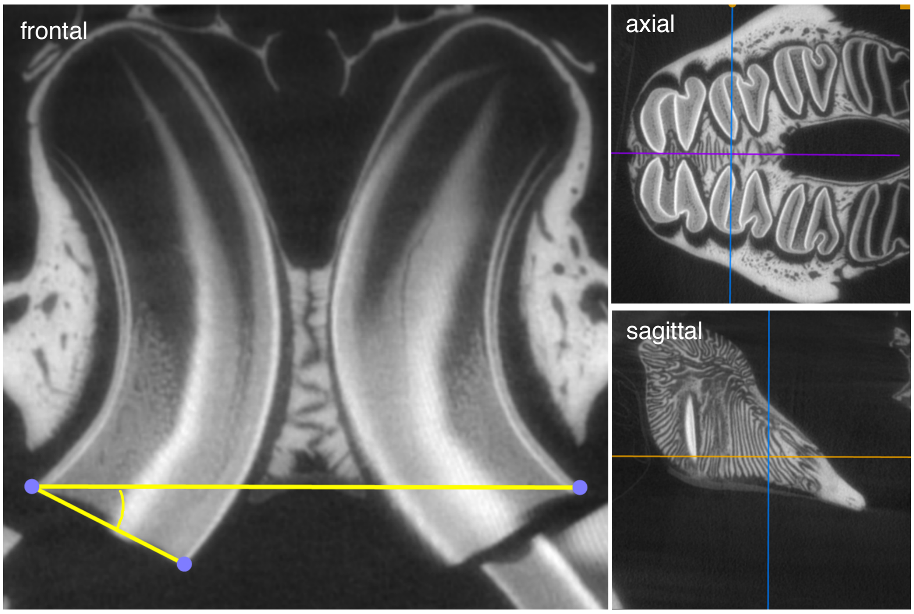
Note that in the mandibular tooth row, the more oblique angulation of m3 in comparison to p4 could potentially influence the tooth row length if the whole row is worn down. In the maxillary tooth rows the angulation of P4 and M3 is less asymmetrical and only there did we have a significant difference between the diet groups (see Table S1).

Figure S7. mCT scan of a guinea pig (*Cavia porcellus)* fed for three weeks with fresh bamboo (BF) for illustration of measurements of tooth width and occlusal area (shown on LR m2) on axial plane (aligned through the occlusal area immediately below the valley between the lophs at the highest point of the cartilage-like cementum). Note that the width is defined as a tracing of the rostral enamel ridge of the re-entrant fold.



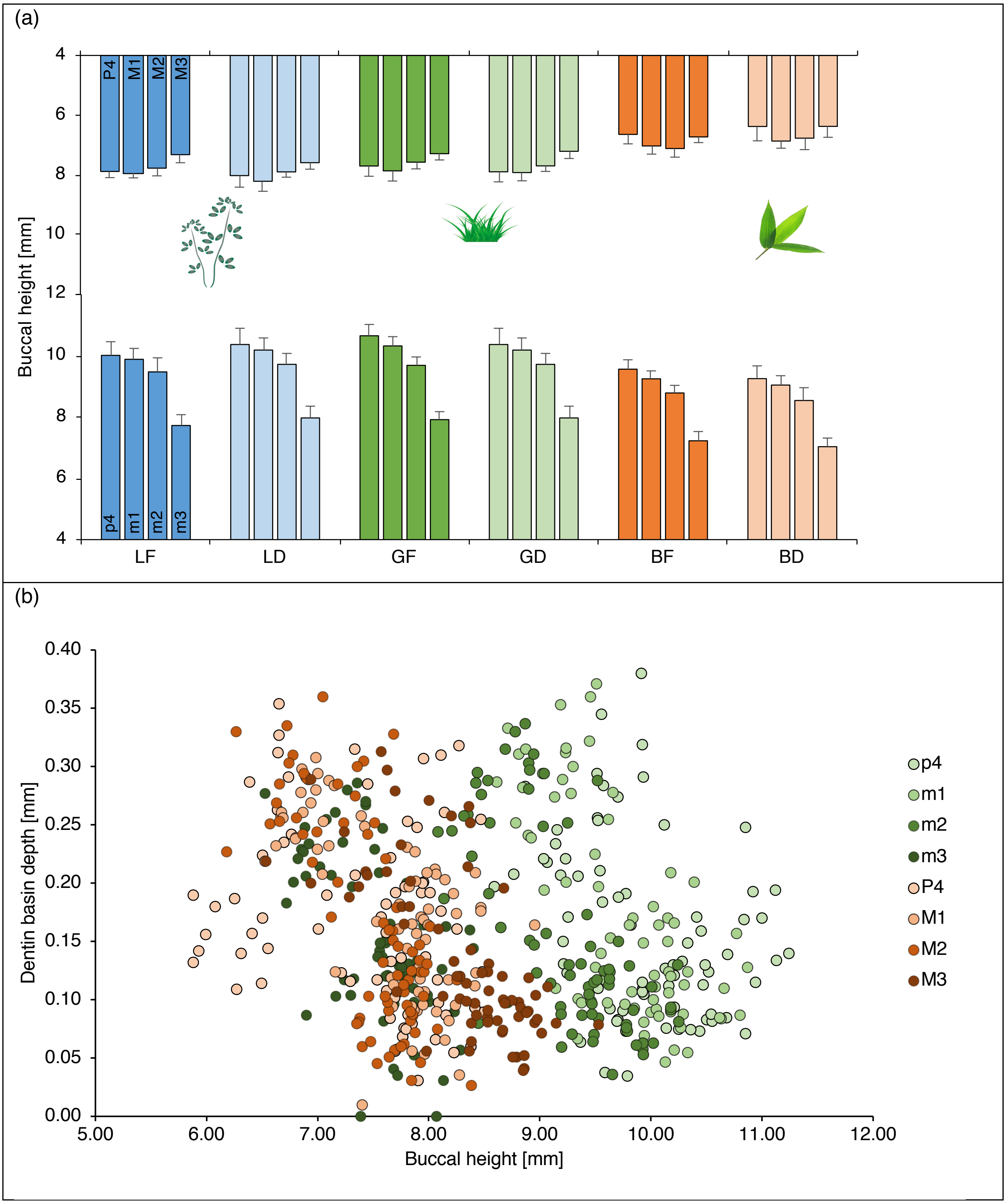
axial plane: left = rostral
frontal plane: left = right side
sagittal plane: left = rostral
thick yellow line = measurements
alignment lines: blue line = axial plane, orange line = sagittal plane, purple line = frontal plane

Figure S8. mCT scan of a guinea pig (*Cavia porcellus)* fed for three weeks with fresh bamboo (BF) for illustration of measurements of the occlusal angle (shown on UR M1) between the marked. Note that occlusal angle was not measured on the mandible as maceration caused symphysiolysis which had to be artificially reversed.



frontal plane: left = right side
axial plane: left = rostral
sagittal plane: left = rostral
thick yellow line = axis for angle measurement
alignment lines: blue line = frontal plane, orange line = axial plane, purple line = sagittal plane

Figure S9. Buccal height for the cheek teeth row (a) of guinea pigs (*Cavia porcellus*) fed with diets of different phytolith concentrations for 3 weeks (LF lucerne fresh, LD lucerne dry, GF grass fresh, GD grass dry, BF bamboo fresh, BD bamboo dry). Note the significantly shorter cheek teeth for guinea pigs fed with bamboo (table S7). Dentine basin depth in relation to the buccal height of each individual tooth (b). Note the steady relationship between shorter teeth and lower dentine basin for each tooth position.



[1] Moriyama, K., Sahara, N., Kageyama, T., Misawa, Y., Hosoya, A. & Ozawa, H. 2006 Scanning electron microscopy of the three different types of cementum in the molar teeth of the guinea pig. *Archives of oral biology* **51**, 439-448. (doi:https://doi.org/10.1016/j.archoralbio.2005.07.001).
[2] von Koenigswald, W., Sander, P.M., Leite, M.B., Mörs, T. & Santel, W. 1994 Functional symmetries in the schmelzmuster and morphology of rootless rodent molars. *Zoological Journal of the Linnean Society* **110**, 141-179. (doi:10.1111/j.1096-3642.1994.tb01474.x).